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Report: 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program Report

Overview: This report presents the 2022 results of the Greenhills Creek Local Aquatic Effects Monitoring Program (GHC LAEMP) (formerly GGCAMP). The 2022 program was designed to monitor and evaluate site-specific indicators of aquatic ecosystem conditions within Greenhills and Gardine creeks, including within the Greenhills Creek Sedimentation Pond.

This report was prepared for Teck by Minnow Environmental Inc.

For More Information

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





2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program Report

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2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program Report

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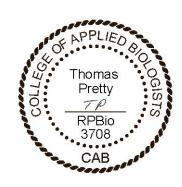
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EXECUTIVE SUMMARY

This report presents the results of the 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP), which monitors and evaluates site-specific indicators of aquatic ecosystem conditions within Greenhills and Gardine creeks and the Greenhills Creek Sedimentation Pond. Calcite (calcium carbonate precipitate) has been observed in creeks in the Elk River watershed and Greenhills Creek was selected as the first creek for calcite management. Application of antiscalant to Lower Greenhills Creek began in October 2017 and has been successful at preventing further calcite deposition. Consequently, to prevent calcite formation in additional parts of the creek, Teck relocated the antiscalant addition system (AAS) to Upper Greenhills Creek, where it began operating in November 2022.

Data collected as part of the GC LAEMP are expected to address three key questions, which are detailed below, along with summaries of the key study results associated with each question. The data collected in 2022 to support the GC LAEMP represented a seventh year of monitoring on Upper Greenhills Creek, a fourth year of monitoring on Gardine Creek, a fifth year of sampling in Greenhills Creek Sedimentation Pond, and a fifth year of aquatic effects monitoring following initiation of antiscalant addition in Lower Greenhills Creek.

Question 1 ("What is the current status of aquatic health in Greenhills and Gardine creeks, as evidenced by physical, chemical, and biological conditions?") was addressed by characterizing existing aquatic environmental conditions within the Greenhills Creek watershed in 2022.

Although Greenhills and Gardine creeks are mine-exposed, aqueous concentrations of most mine-related constituents were below relevant guidelines, screening values, benchmarks, and updated effect concentrations (EC) in 2022. Exceptions included concentrations of total dissolved solids (TDS), sulphate, total uranium, and dissolved cadmium and nickel. Concentrations of TDS and sulphate were often above applicable screening values or updated EC, respectively, in 2022, and were higher in Greenhills versus Gardine creek. Concentrations of total uranium were also above the British Columbia Water Quality Guideline (BC WQG) throughout Greenhills Creek. Concentrations of dissolved cadmium and dissolved nickel were above Elk Valley Water Quality Plan (EVWQP) benchmarks and proposed benchmarks, respectively, at upstream sampling locations on Upper Greenhills Creek, but exhibited patterns of dilution downstream from the confluence with Gardine Creek.

In 2022, calcite was present throughout Greenhills Creek and in lower Gardine Creek. The section of Lower Greenhills Creek downstream from the historical AAS had significantly lower calcite presence (C_p) and concretion (C_c) scores relative to biological monitoring areas upstream from treatment (i.e., on Upper Greenhills Creek).

Sediment chemistry analyses for Gardine Creek, Lower Greenhills Creek, and the Greenhills Creek Sedimentation Pond indicated concentrations of cadmium, nickel, and selenium in the potentially mobile¹ sediment fractions were frequently above the lower British Columbia Working Sediment Quality Guidelines (BC WSQG) in 2022. Additionally, a number of polycyclic aromatic hydrocarbons (PAHs) had concentrations that frequently exceeded the BC WSQG.

Upstream-to-downstream differences in benthic invertebrate communities were identified within Greenhills and Gardine creeks in 2022. These differences included higher benthic invertebrate biomass, percent (%) Ephemeroptera, Plecoptera, and Trichoptera (EPT), and family richness and lower %Diptera in Lower versus Upper Greenhills Creek. Additionally, %EPT was lower and %Diptera was higher in lower versus upper Gardine Creek, where C_p , C_c , and concentrations of TDS and sulphate were lower in 2022. Overall, %EPT and %Diptera were strongly negatively or positively correlated, respectively, with TDS and sulphate concentrations. Although the potential influence of TDS and sulphate cannot be ruled out, spatial patterns in benthic invertebrate communities are thought to be largely attributed to calcite conditions.

Selenium concentrations in benthic invertebrate tissues tended to reflect patterns in aqueous selenium speciation. Samples from Lower Greenhills Creek had relatively high (i.e., relative to other areas in the watershed, the reference area normal range, and EVWQP Level 2 Benchmarks) selenium concentrations in composite-taxa benthic invertebrate tissues in 2022. This was likely due to enhanced generation of organoselenium species in the Greenhills Creek Sedimentation Pond and carry-over effects downstream.

Westslope cutthroat trout (WCT; Oncorhynchus clarkii lewisi), are the only fish species in the Greenhills Creek watershed. Fish within Upper Greenhills and Gardine creeks and the Greenhills Creek Sedimentation Pond represent an isolated population. The WCT in Lower Greenhills Creek are considered part of the Upper Fording River (UFR) population and are unable to access habitats within and upstream from the pond.

In 2022, WCT population monitoring was completed upstream and downstream from the pond to characterize fish spawning, densities, and condition, as well as the size of age-0 fish. Redds were observed in Gardine Creek and Upper and Lower Greenhills creeks, but the estimated total number of unique nests was low. Estimated lineal densities² of age-1 and age-2+ WCT were higher in Lower Greenhills and Gardine creeks relative to Upper Greenhills Creek. Estimated differences (2%) in fish condition among Upper and Lower Greenhills and Gardine

² I.e., densities calculated based on units of stream length, rather than stream area.



¹ The potentially mobile sediment fractions represent a highly conservative estimate of the bioavailable constituent concentrations, given that it would take highly unusual/aggressive reducing and oxidizing conditions, respectively, to mobilize fractions 3 and 4 and these conditions are not likely to occur in Greenhills and Gardine creeks.

creeks in 2022 were not considered biologically meaningful, given the uncertainty in the estimates. The estimated mean length of age-0 WCT was larger in Lower Greenhills than all other monitored tributaries and the UFR main stem.

Answering question 2 ("Have physical, chemical, and/or biological conditions indicative of aquatic health in Greenhills and Gardine creeks changed over time and are the changes unexpected based on the activities and projects occurring in the watershed?") required temporal evaluations of physical, chemical, and biological data to identify patterns that may be indicative of unexpected changes over time.

Overall, aqueous concentrations of mine-related constituents in Greenhills and Gardine creeks in 2022 were lower than or comparable to those reported for the base years of monitoring, and these results are generally as expected.³

The C_c scores collected from riffle habitats as part of the GC LAEMP were lower in Lower Greenhills Creek in 2022 relative to 2017. These results are supported by the results of the Regional Calcite Monitoring Program. The reduction in C_C observed for Lower Greenhills Creek is considered indicative of effective treatment with antiscalant.

Concentrations of metals in bulk sediment samples from Greenhills and Gardine creeks were generally lower than or comparable to previous years, whereas concentrations of PAHs in Gardine Creek sediments were higher in 2022 relative to 2019 and 2020. Results of Sequential Extraction Analysis (SEA) for Gardine Creek indicated that the distribution of metals among sediment fractions was generally consistent over time.

Benthic invertebrate community endpoints in 2022 were generally consistent with observations from previous years and few temporal patterns were identified. In samples from Lower Greenhills Creek (treated) %Ephemeroptera increased relative Upper Greenhills Creek (untreated) based on comparisons among years with and prior to initiation of water treatment on Lower Greenhills Creek.

Estimated densities and abundances of age-1 or age-2+ WCT, fish condition, and incidences of external anomalies changed over time within the Greenhills Creek watershed. Estimated densities and abundances were similar in 2022 compared to 2020 and 2021, but were lower compared to previous years (i.e., 2015 to 2019). Estimated fish condition decreased between 2017 and 2021 in Upper Greenhills Creek and between 2017 and 2020 in Lower Greenhills Creek, relative to a typical year and UFR sub-population. In 2022 however, fish

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³ E.g., based on activities within the watershed, the locations of individual monthly water quality monitoring stations relative to sources of dilution (e.g., Gardine Creek) or the AAS, stabilization of the east spoil (post-2014 failure), and cessation of pumping from the Cougar Phase 3 Pit after 2018.

condition in Upper and Lower Greenhills Creek was improved relative to 2020 and 2021, respectively, and was considered comparable to or better than a typical year and UFR sub-population, based on comparisons for a 100 mm fish. Finally, no external anomalies or parasites were reported for WCT captured from the Greenhills Creek watershed in 2022.

Question 3 ("Can observed changes be linked to: antiscalant addition in Lower Greenhills Creek; activities to support relocation of the antiscalant addition facility to Upper Greenhills Creek; or initiation of antiscalant addition on Upper Greenhills Creek starting in October 2022?") was addressed by comparing the treated area on Lower Greenhills Creek to untreated areas before and after initiation of antiscalant addition in 2017.

Overall, antiscalant addition has had limited influence on water quality in Lower Greenhills Creek; differences in aqueous concentrations of mine-related constituents upstream and downstream from treatment in 2022 did not differ significantly from pre-treatment. Total and dissolved molybdenum were the only exceptions as molybdenum is a component of the antiscalant compound. Elevated concentrations of organoselenium species in water from Lower Greenhills Creek appear to be attributed to the influence of the Greenhills Creek Sedimentation Pond, rather than water treatment.

The lower incidence of calcite concretion in Lower Greenhills Creek throughout 2020 to 2022 is primarily attributed to successful water treatment with antiscalant. Overall, it appears that the antiscalant addition has prevented further calcification of the stream bed in Lower Greenhills Creek, downstream from the historical AAS location.

The observed increases in %Ephemeroptera within Lower Greenhills Creek following initiation of antiscalant addition are considered indicative of improvements in calcite conditions downstream from the AAS (i.e., prevention of further calcite deposition and lower C_c scores).

The WCT captured from Lower Greenhills Creek in 2022 were in good condition and good external health. Therefore, it is concluded that antiscalant addition did not negatively impact these endpoints in 2022. Conditions of water quality, calcite concretion, and food availability have remained unchanged or improved relative to pre-treatment.

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ACRONYMS AND ABBREVIATIONS

AAS – Antiscalant Addition System

ADIT – Aquatic Data Integration Tool

ALS - ALS Environmental

AMP – Adaptive Management Plan

ANOVA – Analysis of Variance

BACI – Before-After-Control-Impact

BC – British Columbia

BC WQG - British Columbia Water Quality Guideline

BC WSQG – British Columbia Working Sediment Quality Guidelines

B-tool – Selenium Speciation Bioaccumulation Tool

CALA – Canadian Association for Laboratory Accreditation Inc.

C_c – Calcite Concretion Score

CCME – Canadian Council of Ministers of the Environment

CI - Calcite Index

CI' - Calcite Index Prime

CMm – Coal Mountain Operation

Cordillera - Cordillera Consulting

C_p - Calcite Presence Score

C_p' - Calcite Presence Score Prime

DQR – Data Quality Review

EC – Effect Concentration

EMA – Environmental Management Act

EMC – Environmental Monitoring Committee

ENV/BCMOECCS – British Columbia Ministry of Environment and Climate Change Strategy

EPT – Ephemeroptera, Plecoptera, and Trichoptera

EVO – Elkview Operation

EVWQP – Elk Valley Water Quality Plan

EWT – Early Warning Triggers

GC LAEMP - Greenhills Creek Aquatic Effects Assessment and Monitoring Program

GHO – Greenhills Operation

KU – Key Uncertainty

LAEMP – Local Aquatic Effects Monitoring Program

LPL – Lowest Practical Level

Minnow – Minnow Environmental Inc.



MOD – Magnitude of Difference

MQ – Management Question

NELAP – National Environmental Laboratory Accreditation Program

PAH – Polycyclic Aromatic Hydrocarbon

QA/QC - Quality Assurance/ Quality Control

QC – Quality Control

RAEMP – Regional Aquatic Effects Monitoring Program

SEA – Sequential Extraction Analysis

SPO - Site Performance Objective

SQI – Sediment Quality Indices

TDS - Total Dissolved Solids

Teck - Teck Coal Limited

TOC – Total Organic Carbon

Trich – TrichAnalytics Inc.

TSS - Total Suspended Solids

UFR – Upper Fording River

WCT – Westslope Cutthroat Trout

ZEAS – Zeas Inc.

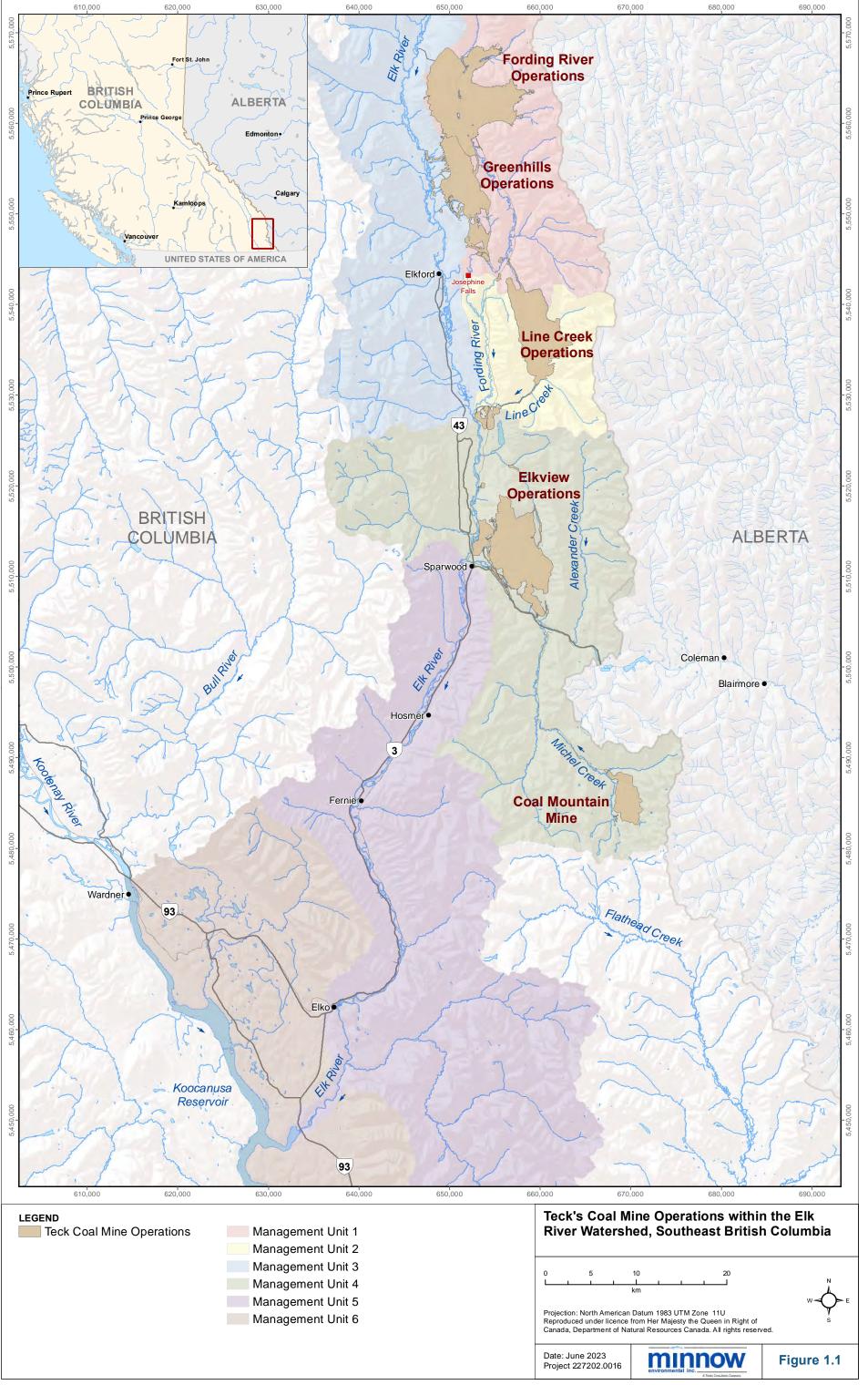
1 INTRODUCTION

1.1 Site Background

Teck Coal Limited (Teck) owns five open pit, metallurgical coal mines in the Elk River watershed in southeast British Columbia (BC; Figure 1.1). Calcite (calcium carbonate precipitate) has been observed in several creeks within the Elk River watershed downstream from Teck's mines and, to a lesser extent, in reference creeks unaffected by mining. In parts of some creeks, calcite precipitation completely covers portions of the creek bed, making the substrate largely immovable. The Elk Valley Water Quality Plan (EVWQP; Teck 2014) identified four priority creeks for calcite management: Greenhills Creek (Greenhills Operations [GHO]), Corbin Creek (Coal Mountain Mine [CMm]), Dry Creek (Elkview Operations [EVO]), and Erickson Creek (EVO). Permit 107517 (the Permit; *Environmental Management Act [EMA]*) and Permit C-137 (*Mines Act*) required that Teck initiate calcite management in at least one priority creek by October 31, 2017. Greenhills Creek was selected as the first creek for calcite management.

Focused pre-treatment studies were initiated in Greenhills Creek in 2016 to characterize the existing aquatic environment and support the evaluation of potential effects associated with proposed calcite management. Application of antiscalant to Lower Greenhills Creek (i.e., the portion of the creek from immediately downstream of Greenhills Creek Sedimentation Pond to the Fording River) was initiated on October 23, 2017. In 2018, the Lower Greenhills Creek Aquatics Effect Monitoring Program was initiated and separate baseline monitoring continued on Upper Greenhills Creek. In 2019, focused studies were initiated on Gardine Creek, a tributary to Greenhills Creek. Monitoring completed at Upper Greenhills and Gardine creeks and the aquatic effects monitoring completed at Lower Greenhills Creek in 2019 were combined into a single program and report (Minnow 2020a). In 2021, the program was renamed as the Greenhills and Gardine Creeks Aquatic Monitoring Program. However, as described below in Section 1.2, the June 30, 2022 Permit amendment designated the program as the Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP).

Application of antiscalant to Lower Greenhills Creek has been successful at preventing further calcite deposition in the approximately 750 metre (m) section of creek downstream from the Greenhills Creek Sedimentation Pond to the confluence with the Upper Fording River (UFR) (Minnow 2020a, 2021a, 2022a). As such, Teck proposed implementing calcite management via antiscalant addition within Upper Greenhills Creek and the Permit was amended on June 30, 2022 to authorize discharge of effluent from the Upper Greenhills Creek antiscalant addition system (AAS). Antiscalant addition on Lower Greenhills Creek ceased on August 21, 2022 and the AAS



was moved to Upper Greenhills Creek where it has been operating intermittently since November 7, 2022.

1.2 Regulatory Background

This annual report for the GC LAEMP is being submitted to the Director of the Ministry of Environment and Climate Change Strategy (ENV/BCMOECCS) and the Environmental Monitoring Committee (EMC) by Teck to satisfy the requirements of amended Permit Sections 8.3.5 and 9.5 (last amended May 18, 2023). Section 8.3.5 of the amended Permit is as follows:

The permittee must implement the monitoring program as described in the approved monitoring program "Greenhills Creek Aquatic Effects Assessment and Monitoring Program" (Greenhills Creek LAEMP). Changes to the aquatic effects monitoring program must be outlined in a study design that is reviewed by the EMC. The permittee must submit the study design to the Director prior to implementation and must describe how EMC advice was considered."

Section 9.5 of the Permit is as follows:

"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 of each year following the data collection calendar year on the following dates: v. Greenhills Creek LAEMP: June 30."

The original study design was submitted to satisfy requirements under Permit Appendix 5B and was approved on October 13, 2017. As part of a June 30, 2022 Permit amendment, Appendix 5B was revised such that the program was moved to Section 8.3 of the Permit (thereby rendering it a Local Aquatic Effects Monitoring Program [LAEMP]). Additionally, Appendix 5B was revised to include an approval for the AAS to operate on Upper Greenhills Creek.

The activities described in this GC LAEMP report for 2022 were completed in accordance with the study designs submitted in July 2021 and August 2022 (Minnow 2021b, 2022b).⁴ The study design for the GC LAEMP is updated annually and is submitted to the EMC and the ENV/BCMOECCS Director. Study design updates that were incorporated into the 2022 field data collection and reporting cycle included the following:

⁴ The sampling completed in February 2022 was completed in accordance with the 2021 GC LAEMP study design (Minnow 2021b) and the September 2022 sampling was completed in accordance with the 2022 study design (Minnow 2022b). Unlike the study designs, the reporting cycle for the GC LAEMP coincides with the calendar year (i.e., from January 1, 2022 to December 31, 2022, inclusive).



- cessation of winter benthic invertebrate tissue chemistry sampling (and supporting water quality data collection) at biological monitoring areas other than RG_GHBP on Lower Greenhills Creek;
- addition of a new biological monitoring area (RG_GHDT) on Upper Greenhills Creek downstream from the new AAS location and upstream from the Gardine Creek mouth;
- cessation of comparisons to regional reference area normal ranges, which are based on timed kick data, for benthic invertebrate community samples collected using areabased methods (see Minnow 2022a); and
- integration of Westslope cutthroat trout (WCT; *Oncorhynchus clarkii lewisi*) population monitoring activities within the framework of the UFR Fish Population Monitoring Program.

These updates were made following careful consideration of the advice and input received from the EMC during, and in the weeks following, engagement sessions held on May 5, 2021 and May 27, 2022.

1.3 Objectives

The overarching objective of the GC LAEMP is to monitor and evaluate site-specific indicators of aquatic ecosystem conditions within Greenhills and Gardine creeks, including within the Greenhills Creek Sedimentation Pond. The program is designed with a primary focus on monitoring aquatic conditions to support the assessment of mine-related effects and provide information for assessing future changes that may result from activities within the watershed (e.g., relocation of the AAS). By assessing site -specific conditions on a more focused basis, the 2022 GC LAEMP also supports the Regional Aquatic Effects Monitoring Program (RAEMP) and the Adaptive Management Plan (AMP). This is achieved by helping to answer questions around effectiveness of calcite management and achievement of site performance objectives (SPOs).

1.4 Key Questions

In early 2021, the study questions associated with previous iterations of the GC LAEMP were reviewed and updated to better reflect the aquatic monitoring needs for Greenhills and Gardine creeks, based on the activities that are ongoing or proposed in the watershed. Early versions of these study questions were presented to the EMC on May 5, 2021 and included in the 2021 study design for the program (Minnow 2021b). For 2022, study questions 1 and 2 were unchanged from 2021, and are as follows:



- 1. What is the current status of aquatic health in Greenhills and Gardine creeks, as evidenced by physical, chemical, and biological conditions?
- 2. Have physical, chemical, and/or biological conditions indicative of aquatic health in Greenhills and Gardine creeks changed over time and are the changes unexpected based on the activities and projects occurring in the watershed?

Study question 3 ("Can observed changes be linked to antiscalant addition in Lower Greenhills Creek, specifically?") from 2021 was revised slightly to reflect relocation of the AAS to Upper Greenhills Creek in 2022:

3. Can observed changes be linked to: antiscalant addition in Lower Greenhills Creek; activities to support relocation of the antiscalant addition facility to Upper Greenhills Creek; or initiation of antiscalant addition on Upper Greenhills Creek starting in October⁵ 2022?

Study questions 1 and 2 were reviewed with the EMC on May 27, 2022. Study question 3 was updated following Teck's receipt of the June 30, 2022 approval to relocate the AAS from Lower Greenhills Creek to Upper Greenhills Creek.

The study questions were addressed by characterizing existing conditions within Greenhills and Gardine creeks and evaluating changes over time (i.e., since the initiation of focused monitoring in 2016) to identify any patterns that may be indicative of unexpected changes (i.e., relative to predictions or general expectations⁶). Endpoints related to water quality, selenium speciation, substrate condition (i.e., calcite index [CI] and calcite index prime [CI'], sediment characteristics, and sediment quality), and the status of aquatic organisms (i.e., benthic invertebrate abundance and community structure, benthic invertebrate biomass, and benthic invertebrate tissue chemistry) were evaluated, as data allowed. As indicated in Section 1.2, fish monitoring was completed as part of a unified, watershed-wide framework implemented by Teck's Fish Team (see Sections 2.6 and 3.5). Relevant data (e.g., flows and water temperatures, CI and CI') collected as part of other monitoring programs (e.g., the Regional Calcite Monitoring Program) were integrated into this 2022 report for the GC LAEMP, as appropriate, to address the study questions.

⁶ "General expectations" may include predictions that were presented in approved plans in a narrative or semi-quantitative form or biological characteristics that are considered to be consistent with expectations based on observed chemical concentrations or calcite conditions, for example.



⁵ Antiscalant addition on Upper Greenhills Creek commenced on November 7, 2022.

1.5 Linkages to Adaptive Management

As required in Section 10 of the Permit, Teck developed an AMP to support implementation of the EVWQP to achieve water quality targets and calcite targets, ensure that human health and the environment are protected, and where necessary, restored, and to facilitate continuous improvement of water quality in the Elk Valley. The AMP was most recently updated in December 2021 (Teck 2021). Adaptive management is a systematic, rigorous approach to environmental management that maximizes learning about uncertainties while simultaneously striving to meet multiple management objectives and adapt management actions based on what is learned. Six stages comprise the adaptive management cycle: assess, design, implement, monitor, evaluate, and adjust. The AMP identifies six Management Questions (MQs) that are re-evaluated at regular intervals. Evaluating these MQs collectively articulates whether Teck is on track to meet the environmental objectives of the EVWQP.

The GC LAEMP was designed to support the assessment of potential aquatic effects associated with antiscalant addition, provide existing conditions information for assessing future changes that may result from activities planned within the watershed, and answer other specific questions on an annual basis (Sections 1.3 and 1.4). Each annual LAEMP cycle (results are reported on June 30 of each year for the preceding calendar year) is also used for tracking issues for which a potential need for an adjustment, using the response framework, has been identified, including biological trigger assessments. Biological triggers are intended as a simple and consistent way to flag potential unexpected monitoring results that may require additional investigation and adjustment. In the current report, combined percentages (%) of Ephemeroptera, Plecoptera, and Trichoptera (EPT) and selenium concentrations in composite-taxa benthic invertebrate tissue samples were assessed against their respective biological triggers (see Sections 2.4.3, 2.5.3, 3.3.4, and 3.4.4).

In addition to addressing questions specific to the GC LAEMP on an annual basis, aquatic monitoring data from the LAEMP will contribute to the broader data set assessed every three years within the RAEMP. The RAEMP is designed to evaluation MQ 5: "Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?" Data from the LAEMP and RAEMP also contribute to answering MQ 2: "Will aquatic ecosystem health be protected by meeting the long-term SPOs?"

Results from this report will also be used to determine whether a biological trigger has been reached. Reaching or exceeding a trigger may lead to an adjustment (Stage 6: Adjust) using the response framework. This is the main report for conveying biological trigger results under the AMP (Sections 3.3.4 and 3.4.4). Implementation of management actions is not

constrained to the AMP or LAEMP annual reporting cycles but may be (and has been) triggered at any time during the monitoring and reporting cycle.

Identifying and reducing environmental management uncertainty is a foundational aspect of adaptive management. Therefore, the AMP identifies key uncertainties (KUs) that, as reduced, fill gaps in current understanding to support the achievement of the EVWQP objectives. Aquatic monitoring data assist in reducing KU 5.1: "How will monitoring data be used to identify potentially important mine-related effects on the aquatic ecosystem?" and KU 2.1 "How will the science-based benchmarks be validated and updated?" Progress on reducing these KUs, and associated learnings, are described in annual AMP reports.

Please refer to the 2021 AMP Update (Teck 2021) for more information on the adaptive management framework, including MQs, KUs, and continuous improvement; linkages between the AMP and other EVWQP programs; and AMP reporting. Progress on gaining new knowledge and reducing KUs is described in annual AMP reports (submitted July 31), and evaluating the answers to MQs are reported in MQ evaluation reports (various submission dates).

2 METHODS

2.1 Design Overview

The design of the 2022 GC LAEMP included the following core technical components (Table 2.1):

- Water quality monitoring and selenium speciation sampling upstream and downstream from the historical (October 2017 to August 2022) AAS location on Lower Greenhills Creek, upstream and downstream from the current (November 2022 to present) AAS location on Upper Greenhills Creek, and in Greenhills Creek Sedimentation Pond;
- 2. Water quality monitoring, including selenium speciation sampling, in Gardine Creek, upstream and downstream from the seeps from the GHO Coarse Coal Rejects;
- 3. Calcite index measurements throughout Greenhills and Gardine creeks⁷;
- 4. Sediment quality monitoring in Lower Greenhills and Gardine creeks, as well as in Greenhills Creek Sedimentation Pond;
- 5. Benthic invertebrate community and biomass sampling (i.e., area-based kick sampling) at areas (six stations per area) throughout Greenhills and Gardine creeks;
- 6. Timed benthic invertebrate community sampling at two biological monitoring areas (three stations each; RG_GHNF and RG_GHDT) on Upper Greenhills Creek (i.e., three-minute kicks)⁸:
- 7. Benthic invertebrate community sampling at six stations within Greenhills Creek Sedimentation Pond; and
- 8. Benthic invertebrate tissue chemistry sampling at areas (three stations per area) throughout Greenhills and Gardine creeks and within Greenhills Creek Sedimentation Pond.

⁸ Benthic invertebrate community data for the timed kick sampling on Lower Greenhills Creek (i.e., at RG_GHCKD, which is sampled as part of the RAEMP), are also interpreted in this 2022 report, as appropriate.



⁷ Calcite index measurements were collected from habitats where benthic invertebrate community samples were collected. This was in addition to the CI and CI' measurements completed in Greenhills and Gardine creeks as part of the Regional Calcite Monitoring Program.

Table 2.1: Overview of the 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP), 2022 a

						Teck -		Februa	ry 2022		September 2022						
Location	Monitoring Area		oroximate UTMs NAD 83, 11U)	River Kilometre	Area Description	Routine Water		Water Quality		Benthic Invertebrates		Water Quality		Calcite Index	Sediment	Benthic Inv	
		Easting	Northing	(km) ^b		Quality	Chemistry	Selenium Speciation	In situ Quality	Composite- taxa Tissue	Chemistry	Selenium Speciation	In situ Quality	Measurements	Quality	Community Structure	Composite- taxa Tissue
	GARD1-75	653316	5549076	1.94	Regional Calcite Monitoring Program Station in Reach 5 of Gardine Creek	1	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
	RG_GAUT	653451	5548928	1.71	Biological Monitoring Area in Reach 4 of Gardine Creek Upstream from GHO Coarse Coal Rejects Seeps	ı	-	-	-	ı	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	5 stations	6 stations	3 stations
) Creek	GARD1-50	653641	5548601	1.24	Regional Calcite Monitoring Program Station in Reach 2 of Gardine Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
Gardine (GARD1-25	653928	5548090	0.64	Regional Calcite Monitoring Program Station in Reach 1 of Gardine Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
	RG_GANF	654277	5547746	0.15	Biological Monitoring Area in Reach 1 of Gardine Creek Upstream from the Confluence with Upper Greenhills Creek and Downstream from the GHO Coarse Coal Rejects Seeps	-	-	-	-	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	5 stations	6 stations	3 stations
	GH_GC1	654271	5547734	0.06	Permitted Water Quality Station on Gardine Creek Upstream from the Confluence with Upper Greenhills Creek	✓	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-
	RG_GHUT	654134	5549945	6.03	Biological Monitoring Area in Reach 10 of Upper Greenhills Creek	-	-	-	-	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	-	6 stations	3 stations
Creek	GREE4-75	654152	5549910	5.98	Regional Calcite Monitoring Program Station in Reach 10 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
sills (GH_CTF	654165	5549540	5.59	Permitted Water Quality Station in Reach 10 of Upper Greenhills Creek	✓	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	=	-	-	-
r Greenhills	GREE4-50	654336	5549133	5.12	Regional Calcite Monitoring Program Station in Reach 9 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
Upper	RG_GHNF	654367	5549052	5.03	Biological Monitoring Area in Reach 9 of Upper Greenhills Creek	-	-	-	-	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	-	6 stations (area- based); 3 stations (CABIN)	3 stations
	GREE4-25	654512	5548365	4.28	Regional Calcite Monitoring Program Station in Reach 8 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-

Notes: UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; - = sampling not included in program design; CABIN = Canadian Aquatic Biomonitoring Network; TBD = to be determined; GHO = Greenhills Operation; RAEMP = Regional Aquatic Effects Monitoring Program.

^a Fish monitoring in Greenhills and Gardine creeks was completed as part of the Upper Fording River Westslope Cutthroat Trout Population Monitoring Program in 2022.

^b Distance from the confluence with the Upper Fording River (Greenhills Creek) or Greenhills Creek (Gardine Creek).

[°] No stratification was observed at the time of sampling, therefore a single surface level water grab was collected from RG_GHP according to the Study Design.

d Data were collected from this location as part of the RAEMP and were used, as appropriate, to support the Greenhills Creek Aquatic Effects Assessment and Monitoring Program.

Table 2.1: Overview of the 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP), 2022 a

						Teck -	February 2022				September 2022						
Location	Monitoring Area		oximate UTMs AD 83, 11U)	River Kilometre	Area Description	Routine Water		Water Quality		Benthic Invertebrates		Water Quality		Calcite Index	Sediment	Benthic Inv	vertebrates
		Easting	Northing	(km) ^b		Quality	Chemistry	Selenium Speciation	In situ Quality	Composite- taxa Tissue	Chemistry	Selenium Speciation	In situ Quality	Measurements	Quality	Community Structure	Composite- taxa Tissue
	GH_USAAS	654461	5548151	4.05	Water Quality Station in Reach 7 of Upper Greenhills Creek, Upstream from Treatment (November 2022)	√	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-
	GH_HWGH_BRB	654435	5548079	3.96	Water Quality Station in Reach 7 of Upper Greenhills Creek, Downstream from Treatment (November 2022)	✓	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-
Creek	RG_GHDT	654288	5547720	3.52	Biological Monitoring Area in Reach 7 of Upper Greenhills Creek Downstream from Treatment (November 2022)	-	-	-	-	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	-	6 stations (area- based); 3 stations (CABIN)	3 stations
Greenhills (GREE3-75	654172	5547243	2.97	Regional Calcite Monitoring Program Station in Reach 6 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
Upper Gre	RG_GHFF	654135	5547185	2.90	Biological Monitoring Area in Reach 6 of Upper Greenhills Creek Downstream from Gardine Creek	-	-	-	-	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	-	6 stations (area- based)	3 stations
	GREE3-50	653990	5546883	2.52	Regional Calcite Monitoring Program Station in Reach 6 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
	GREE3-25	653918	5546481	2.05	Regional Calcite Monitoring Program Station in Reach 5 of Upper Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
	GH_GH1B	653740	5546142	1.62	Permitted Water Quality Station at the Inlet of Greenhills Sediment Pond	✓	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-
Greenhills Creek Sedimentation Pond	RG_GHP	653445	5546033	-	Greenhills Sediment Pond - Depositional Area	-	-	-	-	-	1 or 2 (concurrent with biological monitoring) °	1 or 2 (concurrent with biological monitoring) ^c	6 (concurrent with biological monitoring) and a profile at the deepest area of the pond	-	6 stations	6 stations	3 stations
Creek	GH_GH1	653577	5545871	0.60	Permitted Water Quality Station Downstream from Greenhills Sediment Pond and the Stilling Basin V-notch (Upstream of Historical [2017 to 2022] Antiscalant Addition)	✓	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-
Greenhills	GREE1-75	653534	5545668	0.38	Regional Calcite Monitoring Program Station in Reach 2 of Lower Greenhills Creek	-	-	-	-	-	-	-	-	1 as part of regional calcite monitoring	-	-	-
Lower Gr	RG_GHBP	653521	5545623	0.33	Biological Monitoring Area in Reach 2 of Lower Greenhills Creek Downstream from the Fording Mine Road	-	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	3 (1 at each benthic invertebrate tissue chemistry station)	3 stations	1 (concurrent with biological monitoring)	1 (concurrent with biological monitoring)	6 (1 at each benthic invertebrate community station)	6 (1 at each benthic invertebrate community station)	5 stations	6 stations	3 stations

Notes: UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; - = sampling not included in program design; CABIN = Canadian Aquatic Biomonitoring Network; TBD = to be determined; GHO = Greenhills Operation; RAEMP = Regional Aquatic Effects Monitoring Program.

^a Fish monitoring in Greenhills and Gardine creeks was completed as part of the Upper Fording River Westslope Cutthroat Trout Population Monitoring Program in 2022.

^b Distance from the confluence with the Upper Fording River (Greenhills Creek) or Greenhills Creek (Gardine Creek).

^c No stratification was observed at the time of sampling, therefore a single surface level water grab was collected from RG_GHP according to the Study Design.

^d Data were collected from this location as part of the RAEMP and were used, as appropriate, to support the Greenhills Creek Aquatic Effects Assessment and Monitoring Program.

Table 2.1: Overview of the 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP), 2022 a

		Approximate UTMs a (NAD 83, 11U)				Teck -	February 2022				September 2022						
Location	Monitoring Area			River Kilometre		Routine	Water Quality			Benthic Invertebrates		Water Quality		Calcite Index	Sediment	Benthic In	vertebrates
		Easting	Northing	(km) ^b		Water Quality	Chemistry	Selenium Speciation	In situ Quality	Composite- taxa Tissue	Chemistry	Selenium Speciation	In situ Quality	Measurements	Quality	Community Structure	Composite- taxa Tissue
		Lusting	Northing		Creambilla Creat Deventuaring from the		1 (concurrent	1 (concurrent	1 (concurrent	tuxu 1135uc	1 (concurrent	1 (concurrent	1 (concurrent	1 (concurrent		Otractare	tuxu 1135uc
8	RG_GHCKD ^d	653537	5545602	0.32	Greenhills Creek Downstream from the Greenhills Creek Sedimentation Pond	-	with biological monitoring)	with biological monitoring)	with biological monitoring)	3 stations	with biological monitoring)	with biological monitoring)	with biological monitoring)	with biological monitoring)	-	3 stations	3 stations
້					Regional Calcite Monitoring Program						g/	g/		1 as part of			
slills	GREE1-50	653494	5545590	0.28	Station in Reach 2 of Lower Greenhills Creek	-	-	-	-	-	-	-	-	regional calcite monitoring	-	-	-
eer					Regional Calcite Monitoring Program	e Monitoring Program						1 as part of					
er Gr	GREE1-25	653386	5545504	0.13	Station in Reach 1 of Lower Greenhills Creek	-	-	-	-	-	-	-	-	regional calcite monitoring	-	-	-
Lowe	GH_GH2	653325	5545481	0.05	Permitted Water Quality Station in Reach 1 of Lower Greenhills Creek Downstream from the Fording Mine Road	√	Teck - routine	-	Teck - routine	-	Teck - routine	-	Teck - routine	-	-	-	-

Notes: UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; - = sampling not included in program design; CABIN = Canadian Aquatic Biomonitoring Network; TBD = to be determined; GHO = Greenhills Operation; RAEMP = Regional Aquatic Effects Monitoring Program.

^a Fish monitoring in Greenhills and Gardine creeks was completed as part of the Upper Fording River Westslope Cutthroat Trout Population Monitoring Program in 2022.

^b Distance from the confluence with the Upper Fording River (Greenhills Creek) or Greenhills Creek (Gardine Creek).

^c No stratification was observed at the time of sampling, therefore a single surface level water grab was collected from RG_GHP according to the Study Design.

^d Data were collected from this location as part of the RAEMP and were used, as appropriate, to support the Greenhills Creek Aquatic Effects Assessment and Monitoring Program.

The 2022 field programs were implemented according to the 2021 and 2022 study designs (Minnow 2021b, 2022b) and sampling was completed in February and September 2022. Results from other monitoring programs (e.g., the Regional Calcite Monitoring Program and Selenium Speciation Monitoring Program) were integrated into this 2022 annual report, where appropriate, to support data interpretation. Additionally, this 2022 GC LAEMP report summarizes the results of WCT monitoring completed in Greenhills and Gardine creeks under the umbrella of the UFR WCT Population Monitoring Program.

2.2 Water Quality

2.2.1 Field Sampling

As required under the Permit, Teck collects monthly water samples and *in situ* measurements at four stations on Upper Greenhills Creek, two stations on Lower Greenhills Creek, and one station on Gardine Creek (Figure 2.1; Table 2.1). ^{10,11} Stations GH_CTF and GH_USAAS are on Upper Greenhills Creek, upstream from the current AAS location (Figure 2.1; Table 2.1). Stations GH_HWGH_BRB and GH_GH1B are also on Upper Greenhills Creek, downstream from the AAS but upstream from the Greenhills Creek Sedimentation Pond (Figure 2.1; Table 2.1). Station GH_GH1 is located on Lower Greenhills Creek, upstream from the historical (October 2017 to August 2022) AAS location (Figure 2.1). Station GH_GH2 is also on Lower Greenhills Creek, downstream from the historical AAS location and upstream from the UFR. Finally, the monitoring station on Gardine Creek (GH_GC1) is immediately upstream from the confluence with Upper Greenhills Creek (Figure 2.1; Table 2.1). Data for each of these stations were used, as appropriate, to support interpretation of the GC LAEMP data.

Water quality monitoring was also completed in February and September 2022, concurrent with benthic invertebrate tissue chemistry and benthic invertebrate community sampling, respectively (see Appendix A for detailed methods). In February 2022, water chemistry and selenium speciation samples were collected from RG_GHBP on Lower Greenhills Creek (Figure 2.1; Table 2.1). In September 2022, water chemistry and selenium speciation samples were collected from RG_GHUT, RG_GHNF, RG_GHDT, and RG_GHFF on Upper Greenhills Creek; RG_GHBP

¹¹ From March 15 to July 31, GH_GH1 is also sampled weekly for total suspended solids [TSS] and turbidity (see Appendix A).



⁹ However, some components of the data analyses associated with the evaluation of biological triggers (Sections 2.4.3 and 2.5.3 and Appendix A) and comparisons to benchmarks for selenium in amphibian diets (see Appendix A) deviated from the study design.

¹⁰ River kilometres (see Table 2.1) for the monthly water quality monitoring stations and biological monitoring areas are shown on Figure 2.1 but are excluded from subsequent figures for sake of space and readability.



on Lower Greenhills Creek; RG_GAUT and RG_GANF on Gardine Creek; and the Greenhills Creek Sedimentation Pond (RG_GHP; Figure 2.1; Table 2.1).

Additional selenium speciation data were collected in 2022 as part of Teck's Selenium Speciation Monitoring Program, which was first implemented in 2021 (ADEPT 2022; ADEPT et al. 2023). Relevant information from the 2022 Selenium Speciation Monitoring Program annual report (ADEPT et al. 2023) was included in the interpretation of the GC LAEMP data, as appropriate.

Quality assurance/quality control (QA/QC) measures included the collection of field duplicates, field blanks, and trip blanks for water chemistry and field duplicates for selenium speciation. Quality control (QC) samples comprised at least 10% of the total samples collected during each sampling event (see Appendix B).

2.2.2 Laboratory Analysis

Water chemistry and selenium speciation samples were shipped to accredited, third-party laboratories for analysis (see Appendix A for details). Specifically, water chemistry samples were shipped to ALS Environmental (ALS) in Calgary, Alberta, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Selenium speciation samples were submitted to Brooks Applied Labs in Seattle, Washington. Brooks Applied Labs are accredited by the National Environmental Laboratory Accreditation Program (NELAP).

A Data Quality Review (DQR) was completed following receipt of the water chemistry and selenium speciation data from February and September 2022 (Appendix B). Data quality information associated with Teck's monthly water sampling are provided in annual reports for Permits 107517 and 6248.

2.2.3 Data Analysis

Water quality data were compared to EVWQP Benchmarks, updated Effect Concentrations (EC), the proposed benchmark for nickel, screening values, Canadian Council of Ministers of the Environment (CCME) guidelines (total mercury), or British Columbia Water Quality Guidelines (BC WQG) for the protection of freshwater aquatic life (BCMOECCS 2021a,b; BCMWLRS 2023; CCME 2003), as appropriate.¹² Additionally, water quality data from Teck's monthly monitoring stations were evaluated to address the following general questions:

Q1: Do the concentrations of mine-related constituents differ among areas?

¹² A discussion of the science-based benchmarks developed for the EVWQP (Teck 2014) and subsequent activities undertaken to validate/update those benchmarks (e.g., the use of updated chronic toxicity information to derive updated EC for sulphate) is provided in Appendix A.



- Q2: Have concentrations of mine-related constituents at the monitoring areas changed over time and are these changes unexpected based on the activities and projects occurring in the watershed (including relocation of the AAS)?
- Q3: Have concentrations of mine-related constituents in Lower Greenhills Creek changed over time relative to upstream following the application of antiscalant (i.e., can observed differences between Upper and Lower Greenhills Creek be attributed to antiscalant addition in Lower Greenhills Creek)?

Question 1 was addressed by comparing water chemistry data among Teck's monthly monitoring stations on Greenhills and Gardine creeks. To evaluate potential mine-related influences on water quality, constituents with Early Warning Triggers (EWTs) were included in the comparisons (see Appendix A). Interpretation focused on identifying upstream-to-downstream differences in concentrations or dilution effects like those observed for some constituents in Greenhills Creek downstream from Gardine Creek (Minnow 2021a, 2022a). Additionally, the data were interpreted in light of the AAS moving from Lower Greenhills Creek to Upper Greenhills Creek in fall 2022.

Question 2 was addressed by evaluating differences in concentrations of constituents with EWTs among years for each of Teck's monthly monitoring stations (see Appendix A). Data collected from 2016 to 2022 were used; however, the analysis was restricted to years with at least six months of data and stations with at least two years of data.

Consistent with the approach for 2021, Question 3 was addressed based on comparisons of May to September means for water quality constituents measured in samples collected from 2017 to 2022 (Minnow 2022a,b).¹³ Differences in aqueous concentrations of constituents observed downstream from the AAS on Lower Greenhills Creek relative to upstream both before and after the introduction of antiscalant treatment were compared using a Before-After-Control-Impact [BACI] design (see Appendix A). A similar analysis was not completed for Upper Greenhills Creek, given the AAS did not begin operating there until November 2022.

Water quality and aqueous selenium speciation data were used to interpret the results of substrate, benthic invertebrate community, and tissue chemistry evaluations, as appropriate (see Sections 3.2 to 3.4, below). This includes selenium speciation data collected as part of the Selenium Speciation Monitoring Program (see Section 2.2.1).

¹³ The AAS was not operating in May 2018, September 2019, or May 2020; consequently, data for these months were excluded from the "after" data set, consistent with previous years (Minnow 2020a, 2021a, 2022a). Additionally, since the AAS ceased to operate on Lower Greenhills Creek in August 2022, the September 2022 data were also excluded from the "after" data set.



2.3 Substrate Quality

2.3.1 Calcite

2.3.1.1 Field Sampling

Calcite monitoring in Greenhills and Gardine creeks in 2022 was completed as part of Teck's Regional Calcite Monitoring Program and concurrent with benthic invertebrate community sampling for the GC LAEMP (Figure 2.2; see also Section 2.4). Six stations on Upper Greenhills Creek, three stations on Lower Greenhills Creek, and three stations on Gardine Creek were monitored as part of the Regional Calcite Monitoring Program (Smit and Robinson 2023; Appendix A). During the September 2022 program for the GC LAEMP, Minnow Environmental Inc. (Minnow) collected calcite data from RG_GHUT, RG_GHNF, RG_GHDT, and RG_GHFF on Upper Greenhills Creek, RG_GHBP on Lower Greenhills Creek, and RG_GAUT, and RG_GANF on Gardine Creek to allow for direct correlation of benthic invertebrate community endpoints with CI and CI' values (Figure 2.2; Table 2.1; Appendix A).

Calcite index measurements were made using methods detailed by Zathey et al. (2021) and summarized in Lotic (2021) (see also Appendix A).

2.3.1.2 Data Analysis

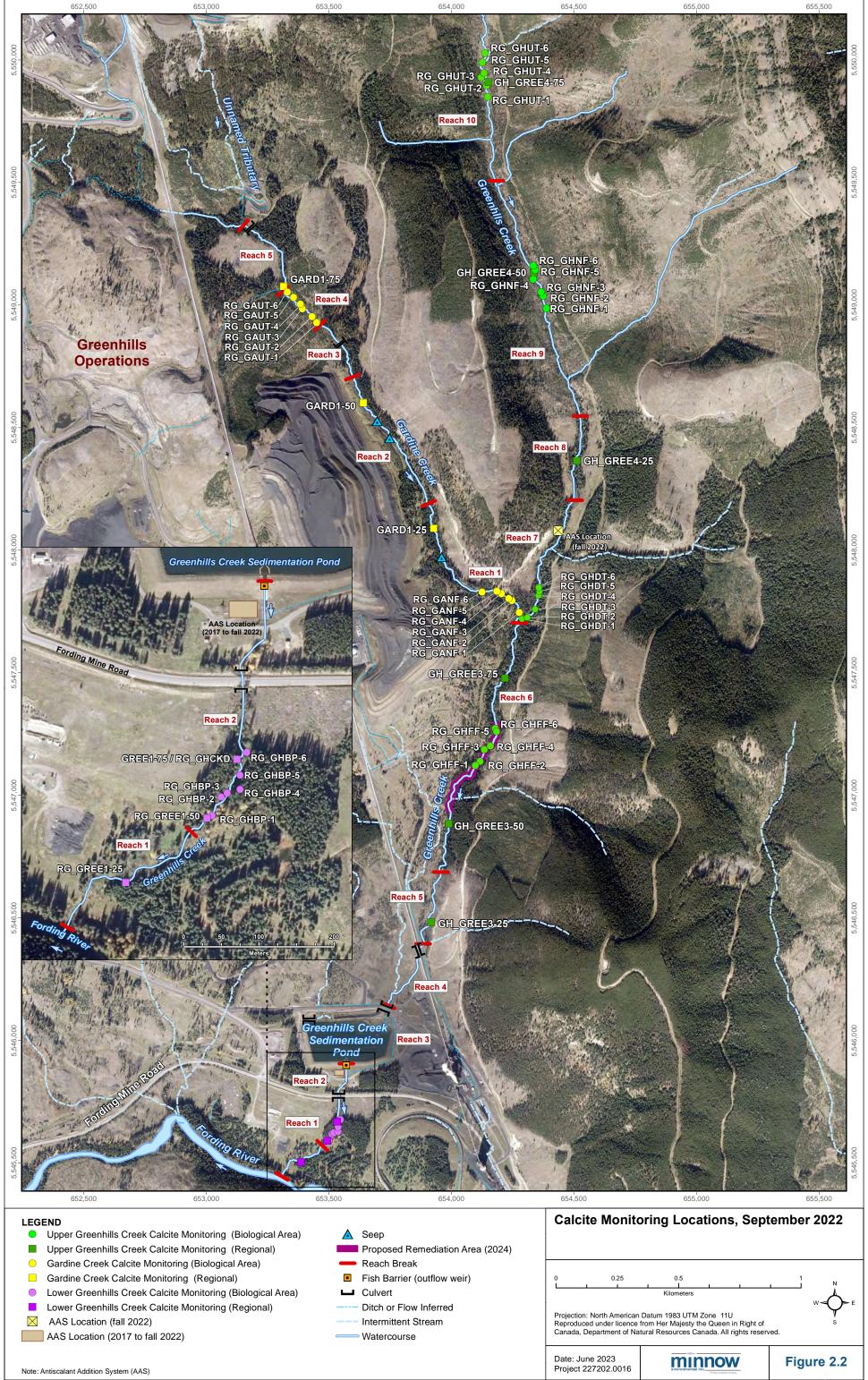
Calcite indices were calculated in two ways (Appendix A). The first method relied on the binary (0 [absent] or 1 [present]) calcite presence (C_p) scores used historically (e.g., Minnow 2020a, 2021a, 2022a; see also Teck 2016). The second method, which was first implemented as part of the GC LAEMP in 2021 (Minnow 2022a), was based on the updated methods described by Zathey et al. (2021).

Calcite indices (CI and CI') were calculated for each biological monitoring area and data were used to address the following general questions:

- Q1: Do calcite scores differ among areas?
- Q2: Have calcite scores changed at the monitoring areas over time and are these changes unexpected based on the activities and projects occurring in the watershed?
- Q3: Have calcite scores in Lower Greenhills Creek changed relative to upstream following the application of antiscalant?

Questions 1 through 3 are unchanged relative to 2021 because calcite measurements were completed in September 2022 and the AAS on Lower Greenhills Creek operated until August 21, 2022. The AAS did not begin operating on Upper Greenhills Creek





until November 7, 2022. Therefore, monitoring completed in September 2022 represented the last year of pre-treatment monitoring on Upper Greenhills Creek.

Questions 1 through 3 were addressed by comparing calcite presence and concretion scores among biological monitoring areas and years (Appendix A). Calcite presence (C_p and C_p) and concretion scores (C_c) were also plotted to support qualitative comparisons among areas and over time within areas. Additionally, CI and CI were used to support interpretation of benthic invertebrate community data (see Section 2.4). Results from the 2022 Regional Calcite Monitoring Program were integrated into the interpretation of calcite data for the GC LAEMP, as appropriate.

2.3.2 Sediment

2.3.2.1 Field Sampling

Sediment chemistry samples were collected from Lower Greenhills Creek (RG_GHBP), Gardine Creek (RG_GAUT and RG_GANF), and Greenhills Creek Sedimentation Pond (RG_GHP) in September 2022 (Figures 2.3 and 2.4; Table 2.1; Appendix A).

2.3.2.2 Laboratory Analysis

Sediment chemistry samples were sent to ALS, a CALA-certified laboratory, in Calgary, Alberta for analysis of moisture content, particle size, total organic carbon (TOC), bulk metals, and polycyclic aromatic hydrocarbons (PAHs) (Appendix A). Additional sub-samples were also subjected to sequential extraction analysis (SEA) for metals (Tessier et al. 1979; Appendix A). The SEA analyses completed in 2022 were intended to address recommendations from the EMC and reduce any residual uncertainties around effects from treatment with antiscalant to sediment chemistry.

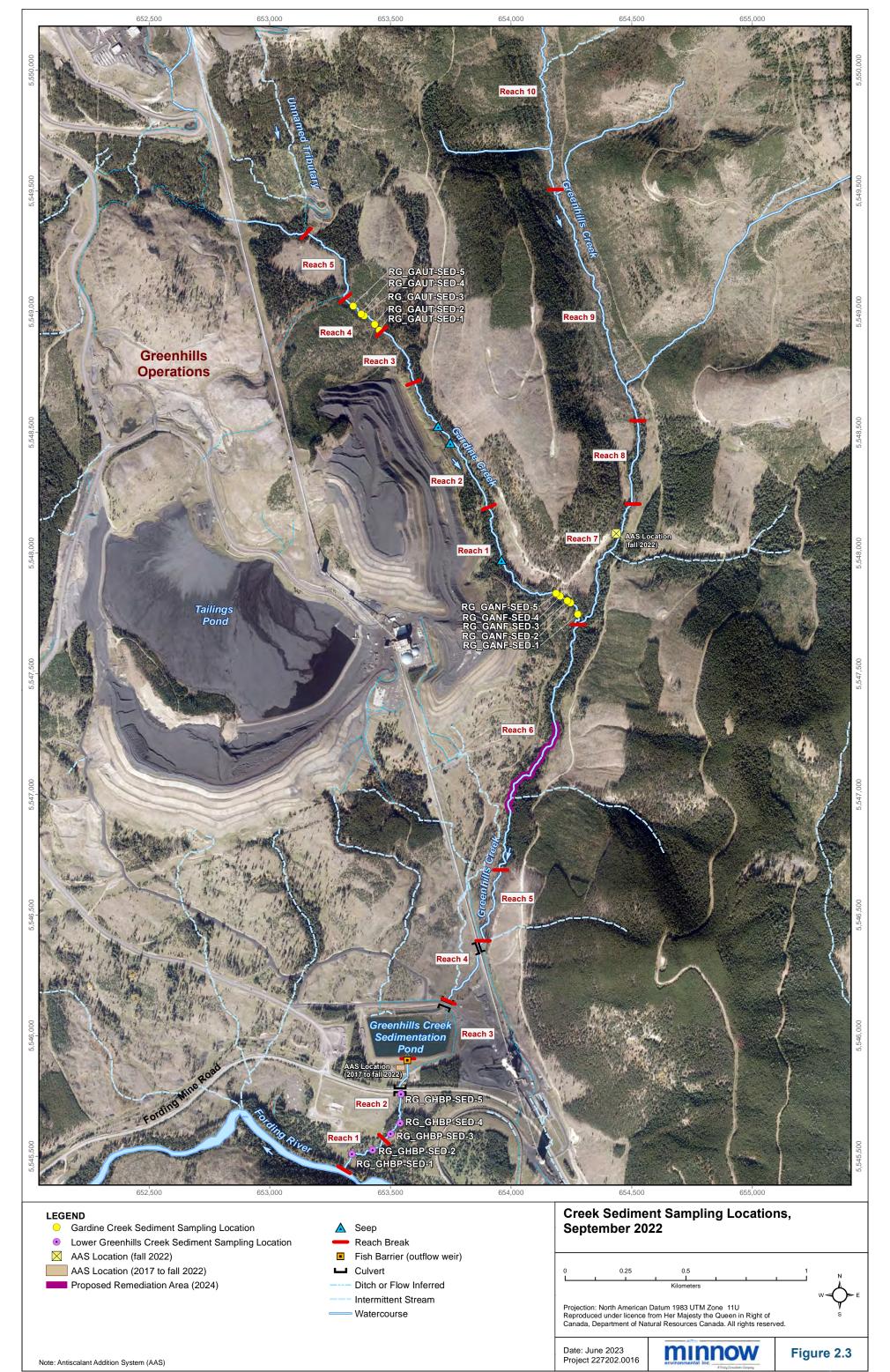
A DQR was completed following receipt of the sediment chemistry data for samples collected in September 2022 (Appendix B).

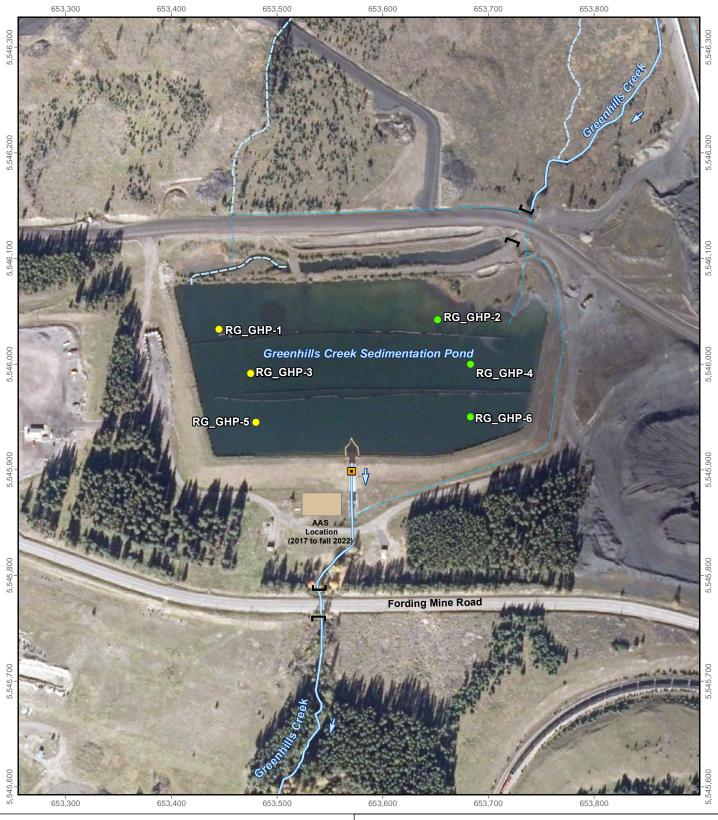
2.3.2.3 Data Analysis

Metal and PAH concentrations in sediment samples were tabulated and plotted to support comparisons to applicable BC Working Sediment Quality Guidelines¹⁴ (BC WSQG; BCMOECCS 2021b). Concentrations in bulk sediment and the sums of concentrations in sediment fractions 1 to 4 (i.e., the "potentially mobile" and therefore potentially bioavailable fractions) were included in the comparisons (Appendix A).

¹⁴ Including the alert concentration for selenium (see BCMOE 2014 and BCMOECCS 2021a).







LEGEND

- Sediment and Benthic Invertebrate Community Sampling Location
- Sediment, Benthic Invertebrate Community, and Tissue
- Fish Barrier (outflow weir)
- Culvert
 - AAS Location (2017 to fall 2022)
- ----Ditch or Flow Inferred
- ---Intermittent Stream

Watercourse

Sediment and Benthic Invertebrate Sampling Locations in Greenhills Creek Sedimentation Pond, September 2022

62.5 125 250 1 1 1 1 1 Meters

Projection: North American Datum 1983 UTM Zone 11U Reproduced under licence from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

ninnow

Figure 2.4

Note: Antiscalant Addition System (AAS)

Sediment chemistry (bulk and SEA) data were used to address the following general questions:

- Q1: Does sediment chemistry differ among areas?
- Q2: Have sediment particle sizes, TOC content, and/or the concentrations of mine-related constituents at the monitoring areas changed over time and are these changes unexpected based on the activities and projects occurring in the watershed?
- Q3: Has sediment chemistry downstream from the AAS changed relative to upstream after the introduction of water treatment?

Sediment sampling (mid-September 2022) was completed shortly after cessation of water treatment on Lower Greenhills Creek (August 21, 2022) and prior to the initiation of antiscalant addition on Upper Greenhills Creek (November 7, 2022). Therefore, sediment chemistry samples collected in September 2022 represent the last year of pre-treatment monitoring for Greenhills Creek Sedimentation Pond (RG_GHP).

Question 1 was addressed by comparing sediment chemistry (bulk and SEA) among biological monitoring areas to evaluate potential mine-related influences on sediment. Censored regression two-way Analysis of Variance (ANOVA) methods were used (Appendix A).

To address Question 2, temporal differences in metal and calcium¹⁵ concentrations in bulk sediments and sediment fractions 1 to 5 were examined for each sediment sampling location. Censored regression two-way ANOVAs were used and were restricted to the years 2019 to 2022 to standardize the sizes of the chemistry data sets among areas and years (Appendix A).

Question 3 was addressed by comparing differences in concentrations of constituents in bulk sediment before (2017) and after (2018 to 2022) initiation of antiscalant addition on Lower Greenhills Creek. A censored regression ANOVA with a nested design was used (Appendix A).

To support conclusions regarding overall sediment quality (i.e., all metals and PAHs considered together), Sediment Quality Indices (SQI) were calculated by year within each area. The SQI integrated the scope, frequency, and amplitude of guideline exceedances and were calculated based on the lower BC WSQG and alert concentration for selenium (BCMOECCS 2021a,b; Appendix A). The SQI were reviewed to identify differences among sampling areas and changes in bulk sediment chemistry over time.

¹⁵ Calcium is a correlate for calcite (see Minnow 2021a).



2.4 Benthic Invertebrate Community

2.4.1 Field Sampling

2.4.1.1 Greenhills and Gardine Creeks

Benthic invertebrate community monitoring completed in 2022 provided a sixth year of pre-treatment data for Upper Greenhills Creek, a fifth year of data following initiation of antiscalant addition on Lower Greenhills Creek, and a fourth year of data collection on Gardine Creek.

Samples representative of lotic habitats were collected from the following biological monitoring areas in September 2022 (Figure 2.5; Table 2.1):

- RG GHUT, RG GHNF, RG GHDT, and RG GHFF on Upper Greenhills Creek;
- · RG GHBP on Lower Greenhills Creek; and
- RG_GAUT and RG_GANF on Gardine Creek.

Consistent with previous years, area-based kick sampling (1/3 square metre [m²]) was completed at six stations per biological monitoring area (Appendix A). Additionally, timed kick sampling was completed at RG_GHNF and RG_GHDT (three stations each) on Upper Greenhills Creek to support comparisons to reference area normal ranges and/or biological triggers for %EPT (see Section 2.4.3).¹⁶

2.4.1.2 Greenhills Creek Sedimentation Pond

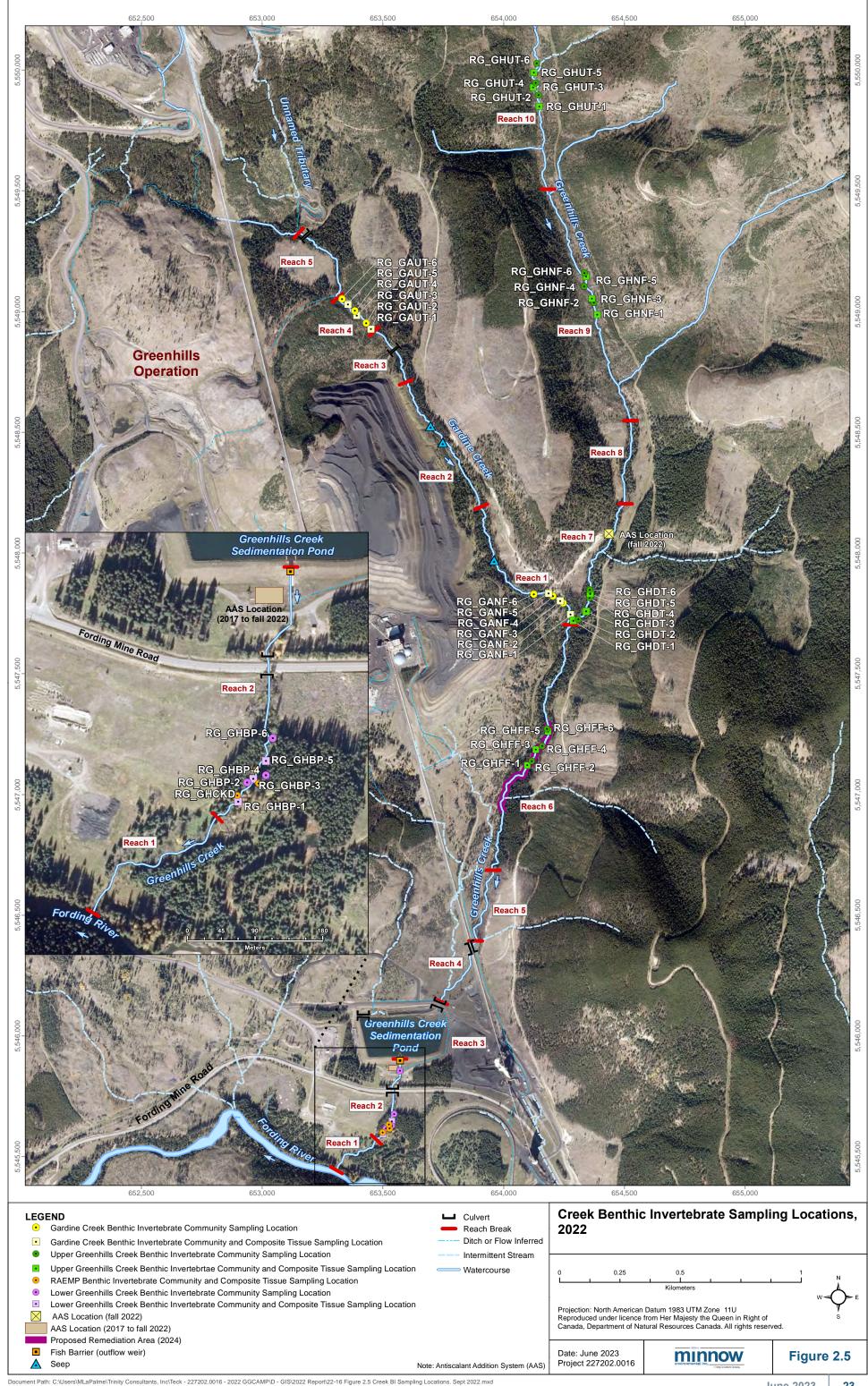
The year 2022 represented the fifth year of benthic invertebrate community data collection in Greenhills Creek Sedimentation Pond. A Petite Ponar grab sampler was used to collect benthic invertebrate community samples from six locations in September 2022 (Figure 2.4; Table 2.1; Appendix A).

2.4.2 Laboratory Analysis

Benthic invertebrate community samples collected using area-based kicks and Petite Ponar grabs were sent to ZEAS Inc. (ZEAS) in Nobleton, Ontario for analysis. Organisms were sorted and identified to the lowest practical level (LPL) of taxonomy before being grouped at the family level for determination of family-level biomass (Appendix A).

¹⁶ Results for benthic invertebrate community sampling at RG_GHCKD on Lower Greenhills Creek will be reported on in the next RAEMP report; however, relevant findings were integrated into this report.





Benthic invertebrate community samples collected using the timed kick method were sent to Cordillera Consulting (Cordillera) in Summerland, BC for sorting and taxonomic identification. Organisms were identified to the LPL of taxonomy (Appendix A).

A DQR was completed following receipt of the benthic invertebrate community data from September 2022 (Appendix B).

2.4.3 Data Analysis

Data for area-based and timed kick samples were summarized by calculating endpoints that are indicators of changes in benthic invertebrate community structure (Appendix A). Plots and tables of the benthic invertebrate community endpoints were used to address the following general questions:

- Q1: Do community endpoints differ among areas?
- Q2: Have community endpoints changed at the monitoring areas over time and are these changes unexpected based on the activities and projects occurring in the watershed?
- Q3: Have community endpoints in Lower Greenhills Creek changed relative to upstream following the application of antiscalant (i.e., can observed differences between Upper and Lower Greenhills Creek be attributed to antiscalant addition)?

Because antiscalant addition on Lower Greenhills Creek did not cease until August 21, 2022, data collected from RG_GHBP on Lower Greenhills Creek in mid-September 2022 are considered representative of a fifth year of monitoring post-antiscalant addition. Because antiscalant addition on Upper Greenhills Creek did not commence until November 7, 2022, benthic invertebrate community data collected from Upper Greenhills and Gardine creeks and the Greenhills Creek Sedimentation Pond in 2022 were included with the "untreated" data collected from 2016 to 2021.

Questions 1 and 2 were addressed together. Differences among areas and years for benthic community endpoints were compared using an ANOVA with factors *Area* and *Year* and *Area x Year* (Appendix A).

Question 3 was addressed by comparing differences in benthic invertebrate community endpoints in relation to the addition of antiscalant based on a BACI design (Green 1979). An ANOVA model was used to fit the data for each area from pre- and post-application of antiscalant (Appendix A). *Post hoc* contrasts were conducted, as appropriate.

Potential relationships between benthic invertebrate community endpoints and calcite measurements (CI, CI', and C_c) and water chemistry data were examined by correlation analysis

(Appendix A). 17 Benthic invertebrate community endpoints for area-based kick samples were included in the analyses.

Data for the timed kick samples were used to support comparisons to regional reference area normal ranges from the RAEMP (RG GHNF, RG GHDT, and RG GHCKD) (Minnow 2020b) and comparisons to the biological trigger for %EPT (RG GHNF and RG GHCKD (Teck 2018, 2021) (Appendix A).

2.5 **Benthic Invertebrate Tissue Chemistry**

2.5.1 Field Sampling

2.5.1.1 Greenhills and Gardine Creeks

Composite-taxa benthic invertebrate tissue chemistry samples were collected from Lower Greenhills Creek (RG GHBP) in February 2022 and from Upper Greenhills Creek (RG GHUT, RG GHNF, RG GHDT, and RG GHFF), Lower Greenhills Creek (RG GHBP), and Gardine Creek (RG GANF and RG GAUT) in September 2022 (Figure 2.5; Table 2.1; Appendix A). The year 2022 represents the final year of winter benthic invertebrate tissue chemistry sampling under the GC LAEMP (Minnow 2022a,b).

The kick sampling method described in Section 2.4.1 and Appendix A (Section A3.1.1.1) was used to collect benthic invertebrate tissue chemistry samples from three stations per biological area. However, rather than being restrained by time or area, kicks were completed until the desired mass of benthic invertebrate tissue was obtained.

2.5.1.2 Greenhills Creek Sedimentation Pond

Three composite-taxa benthic invertebrate tissue chemistry samples were collected from depositional areas within Greenhills Creek Sedimentation Pond (RG GHP) in September 2022 (Figure 2.4; Table 2.1). Each of the three samples corresponded with one of six benthic invertebrate community sampling locations and were collected using the same methods described in Section 2.4.1.2 and Appendix A (Section A3.1.1.2).

2.5.2 Laboratory Analysis

Benthic invertebrate tissue samples were sent to TrichAnalytics Inc. (Trich), which is a CALA-accredited laboratory, in Saanichton, BC. Frozen samples were analyzed for metal concentrations and results were reported on a dry weight basis (Appendix A).

¹⁷ Predictive models for benthic invertebrate communities are being developed for use in adaptive management and biological monitoring. Once these models are available for implementation, they may be used in place of the correlation analyses described herein.



A DQR was completed following receipt of the benthic invertebrate tissue data from February and September 2022 (Appendix B).

2.5.3 Data Analysis

Benthic invertebrate tissue selenium concentrations for samples collected in 2022 were summarized for each of the sampling areas in Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond and were used to address the following general questions:

- Q1: Do tissue selenium concentrations differ among areas?
- Q2: Have selenium concentrations in benthic invertebrate tissues at the monitoring areas changed over time and are these changes attributable to activities and projects occurring in the watershed, including the addition of antiscalant to Lower Greenhills Creek?
- Q3: Are selenium concentrations in benthic invertebrate tissues as expected, based on water quality?

Questions 1 and 2 were addressed together. Differences among areas and years for benthic invertebrate tissue selenium concentrations reported for September samples were compared using an ANOVA, as described in Section 2.4.3 and Appendix A. A separate ANOVA was used to compare selenium concentrations measured in composite-taxa samples from February and September of each year (i.e., 2019 to 2022; no winter sampling was completed in 2018; Appendix A).

Question 3 was addressed, in part, by comparing selenium concentrations in benthic invertebrate tissue chemistry samples from lotic habitats to prediction intervals generated from the regional lotic bioaccumulation model (Golder 2020; Appendix A). If observed concentrations were higher than the upper prediction limits, tissue concentrations were considered higher than expected.

Concentrations of selenium in benthic invertebrate tissues from Greenhills Creek Sedimentation Pond were not evaluated using the lotic or lentic bioaccumulation models developed for the Elk River watershed (Golder 2020). The Greenhills Creek Sedimentation Pond possesses some characteristics of a lentic environment (e.g., longer residence time, finer substrates, and abundant vegetation). However, the lentic bioaccumulation model was developed based on data for natural and naturalized lentic areas (i.e., data for sedimentation ponds were not included). Therefore, there is too much uncertainty regarding the applicability of the lentic model to the Greenhills Creek Sedimentation Pond to warrant comparisons to model predictions at this time.

Question 3 was also addressed through the evaluation of biological triggers developed for selenium concentrations in benthic invertebrate tissues (Teck 2018, 2021). Similar to the biological trigger for %EPT (Section 2.4.3 and Appendix A, Section A3.1.3), biological triggers for

selenium concentrations were applied to biological monitoring areas RG_GHNF and RG GHBP/RG GHCKD on Upper and Lower Greenhills Creek, respectively.

Selenium concentrations in benthic invertebrate tissue samples were also interpreted using the selenium speciation bioaccumulation tool (B-tool; de Bruyn and Luoma 2021), regional reference area normal ranges, EVWQP Benchmarks, and relevant EC (Appendix A).

2.6 Westslope Cutthroat Trout

2.6.1 Field Sampling

In 2022, WCT population monitoring in Greenhills and Gardine creeks was completed within the framework of the UFR Fish Population Monitoring Program (Thorley et al. 2022a; see also WSP and Poisson 2023 [Appendix C] for detailed methods). Spawning (redd) surveys (early June to early August) and backpack electrofishing (late August and early September) were completed within Upper Greenhills, Lower Greenhills, and Gardine creeks. Night-time dip-net surveys (October) were also completed within Lower Greenhills Creek to support size estimates for age-0 fish. Observations of WCT in the plunge pool at the outlet of the duckbill culvert on Lower Greenhills Creek were recorded as part of snorkel surveys (August). Other observations of WCT (e.g., during effectiveness monitoring at the Stilling Basin and decant channel downstream from the Greenhills Creek Sedimentation Pond) were also documented.

Handling of WCT was completed in accordance with Teck's Field Methods and Data Collection Standards (Thorley et al. 2022b) and the study design for the UFR Fish Population Monitoring Program (Thorley et al. 2022a).

2.6.2 Data Analysis

Data collected during WCT monitoring activities completed in 2022 were compiled along with historical data for Greenhills and Gardine creeks and the rest of the 2022 data for the UFR Fish Population Monitoring Program (Thorley et al. 2023a,b; see also Appendix C). Westslope cutthroat trout within Upper Greenhills and Gardine creeks were treated as a single, separate sub-population from the WCT in Lower Greenhills Creek (Appendix C). Here, the data included in the stand-alone WCT monitoring report for Upper and Lower Greenhills and Gardine creeks were evaluated through the lens of the study questions for the 2022 GC LAEMP (Section 1.4). Specifically, the data were evaluated to address the following general questions:

- Q1: Do estimates of WCT abundance, densities, or health endpoints differ among areas?¹⁸
- Q2: Have endpoints changed at the monitoring areas over time and are these changes expected based on the activities and projects occurring in the watershed, including the addition of antiscalant to Lower Greenhills Creek?

Questions 1 and 2 from the GC LAEMP were addressed by comparing abundances, densities, and condition of age-1 and age-2+ WCT qualitatively among areas and years (Appendix C). Abundance, densities, and fish condition were calculated according to Thorley et al. (2022a) and as described in Appendix C (WSP and Poisson 2023). Results for condition were standardized to a fish with a fork length of 100 millimetres (mm) and expressed as the percent change in predicted body weight relative to a typical sub-population in a typical year (Appendix C).

Questions 1 and 2 from the GC LAEMP were also addressed by comparing incidences of external anomalies observed during fish processing (e.g., parasites, deformities, erosion, lesions, tumours) among areas and between 2021 and 2022. External anomaly data will be reported on separately from the stand-alone Greenhills Creek 2022 Fish Population Monitoring report provided in Appendix C (WSP and Poisson 2023). Temporal comparisons were restricted to 2021 and 2022 because, prior to 2021, external assessments were completed based on the classification system described by Sanders et al. (1999), whereas the approach for 2021 and 2022 was based on the updated approach from the RAEMP (Minnow 2021a,c).

No fish tissue chemistry monitoring was completed in the Greenhills Creek watershed in 2022, in an effort to minimize fish handling and risks to WCT, and there were no incidental mortalities that could have been sampled for tissue chemistry. Consequently, biological triggers developed for selenium concentrations in WCT muscle as part of Teck's AMP (Teck 2018, 2021) were not evaluated in 2022. However, water quality (Sections 2.2 and 3.1) and benthic invertebrate tissue chemistry (Sections 2.5 and 3.4) are sampled and evaluated on a routine basis (i.e., monthly, semi-annually) and are used to evaluate risks to WCT.

¹⁸ Fish biomass is also referenced in Section 4.3 of Appendix C (WSP and Poisson 2023); however, WCT biomass was not among the endpoints evaluated for Greenhills and Gardine creeks in 2022, which is consistent with the GC LAEMP study design (Minnow 2022b).



3 RESULTS

3.1 Water Quality

3.1.1 Gardine Creek

At upper Gardine Creek (RG_GAUT), concentrations of mine-related constituents in 2022 were below the relevant BC WQG, CCME guideline for total mercury, EVWQP Benchmarks, proposed benchmarks, updated EC, and screening values (Appendix Figures E.1 to E.17; Appendix Table E.1). In lower Gardine Creek (RG_GANF and GH_GC1), concentrations of total dissolved solids (TDS) and sulphate were often above screening values or updated EC, respectively (Appendix Figures E.1 to E.17; Appendix Table E.1 and E2). Concentrations of organoselenium species at RG_GAUT and RG_GANF were among the lowest reported within the Greenhills Creek watershed in 2022 (Appendix Table E.3). Overall, the water quality results for Gardine Creek are consistent with previous years of monitoring.

The upstream-to-downstream differences in water quality within Gardine Creek are likely attributed to the seeps from the GHO Coarse Coal Rejects, which enter the creek between RG_GAUT and GH_GC1/RG_GANF (Figure 2.1). Regardless, Gardine Creek continues to act as an overall source of dilution for some mine-related constituents in Upper Greenhills Creek (e.g., total antimony, total and dissolved nickel) (see Section 3.1.2 and Appendix Figure E.18; Minnow 2022a).

Concentrations of mine-related constituents that were measured in water samples from lower Gardine Creek (GH_GC1) were comparable to or decreased significantly relative to the base year of monitoring (i.e., 2017) (Appendix Figures E.1 to E.17; Appendix Table E.4). Specifically, concentrations of TDS; total antimony, boron, manganese, nickel, and uranium; and dissolved cadmium were between 25 and 55% lower in 2022 relative to 2017 (Appendix Table E.4).

3.1.2 Upper and Lower Greenhills Creek

Concentrations of TDS and sulphate in the monthly water samples from Upper and Lower Greenhills Creek often exceeded screening values or updated EC, respectively, in 2022 (Figure 2.1; Appendix Figures E.1 to E.18; Appendix Table E.2). Total uranium concentrations in the monthly samples were also often above the BC WQG (Appendix Table E.2). Work is underway within the RAEMP framework to investigate potential relevant pathways of effects to benthic invertebrates from elevated aqueous uranium concentrations.

Concentrations of dissolved cadmium were higher at GH_CTF (furthest upstream station on Upper Greenhills Creek) relative to stations downstream from the Gardine Creek mouth (i.e., at

GH_GH1B, GH_GH1, and GH_GH2; Appendix Figure E.18). Seventeen percent of monthly samples from GH_CTF had dissolved cadmium concentrations above the long-term BC WQG; however, concentrations throughout Greenhills Creek were below the most conservative EVWQP benchmark (Appendix Figure E.16; Appendix Table E.1).

Concentrations of dissolved nickel¹⁹ were above Level 3 proposed benchmarks at the furthest upstream stations on Upper Greenhills Creek (i.e., GH_CTF and GH_HWGH_BRB; Appendix Figure E.12; Appendix Table E.2). Dissolved nickel concentrations downstream from the Gardine Creek mouth (i.e., at GH_GH1B, GH_GH1, and GH_GH2) were significantly lower relative to upstream (Appendix Figure E.18). However, concentrations were still occasionally above Level 2 (25% of samples from GH_GH1B) or Level 1 (33% of samples from GH_GH1 and GH_GH2) proposed benchmarks (Appendix Table E.2).

Water chemistry sampling associated with the February and September 2022 field programs for the GC LAEMP (Figure 2.1; Table 2.1; see also Appendix A) showed results that were generally similar to the monthly water quality monitoring stations (Appendix Tables E.1 and E.2). Within Greenhills Creek, TDS concentrations were consistently above the Level 1 screening value and sulphate concentrations were above Level 2 or Level 3 updated EC throughout the creek. Concentrations of nitrate and total selenium and uranium appeared to decrease with distance downstream, despite concentrations of total uranium being above the relevant long-term BC WQG throughout Greenhills Creek in September 2022. Concentrations of dissolved nickel were above the Level 3 proposed benchmark at the furthest upstream biological monitoring areas (i.e., RG_GHUT and RG_GHNF) and decreased with distance downstream (i.e., were above Level 2 updated EC at RG_GHDT and RG_GHFF and then below Level 2 updated EC downstream at RG_GHP and RG_GHBP) (Appendix Figure E.12; Appendix Table E.1).

The results of the aqueous selenium speciation analyses completed as part of the GC LAEMP and Selenium Speciation Monitoring Program in 2022 indicated selenium was predominately in the form of selenate and concentrations of organoselenium species tended to differ among areas (Appendix Table E.3; see also ADEPT et al. 2023). Concentrations of organoselenium species dimethylselenoxide and methylseleninic acid, which have been linked to higher bioaccumulative potential (e.g., ADEPT 2022) tended to be higher downstream from the Greenhills Creek Sedimentation Pond relative to upstream in 2022, based on qualitative comparisons (Appendix Table E.3). These results are consistent with those for 2021 and are attributed to enhanced formation of organoselenium species resulting from processes within the pond and carry-over effects to lotic habitats downstream (Golder 2021; Minnow 2022a).

¹⁹ Dissolved nickel does not have an EWT, but has proposed benchmarks (Golder 2022a).



Concentrations of most mine-related constituents have remained relatively stable or decreased over time at Teck's monthly (routine) water quality monitoring stations on Upper and Lower E.17; Greenhills Creek (Appendix **Figures** E.1 to Appendix Table E.4). Specifically, concentrations of nitrate, total antimony, total molybdenum, and total nickel decreased significantly over time at all monthly monitoring stations and concentrations of total barium and manganese decreased at all stations except GH GH1B (Appendix Table E.4). Total zinc concentrations at GH CTF (furthest upstream station) were also lower in 2022 relative to 2017 and 2018 (Appendix Table E.4). The results of the statistical comparisons for the monthly water quality samples from Greenhills Creek are supported by visual comparisons of the water chemistry data collected over time at biological monitoring areas sampled as part of the GC LAEMP (Appendix Figures E.1 to E.17).

Total selenium and lithium were the only mine-related constituents with concentrations that increased over time at one or more monthly water quality monitoring station on Greenhills Creek (Appendix Table E.4). Total selenium concentrations at GH_GH1 on Lower Greenhills Creek were higher in 2022 relative to 2016 but comparable to 2017 to 2021 (Appendix Table E.4). These results are not attributed to antiscalant addition, given GH_GH1 was located upstream from the AAS and concentrations at areas downstream of the historical AAS (e.g., RG_GHBP and GH_GH2) did not increase over time (Appendix Figure E.13). Although concentrations of total lithium at monthly and GC LAEMP monitoring areas on Upper Greenhills Creek and GH_GH1 were generally higher in 2022 relative to 2016 or 2017, they were comparable to concentrations reported in 2020 and 2021 (Figure 2.1; Appendix Figure E.8; Appendix Table E.4).

Preventative treatment for calcite in Lower Greenhills Creek occurred from October 23, 2017 to August 22, 2022 and water samples collected between those dates are considered representative of conditions associated with calcite management. In 2022, no significant differences in the ratios between upstream (GH_GH1) and downstream (GH_GH2) concentrations of mine-related constituents, other than total and dissolved molybdenum, were observed relative to pre-treatment (i.e., 2017; Figure 3.1; Appendix Table E.5). Total and dissolved molybdenum concentrations were 87% and 88% higher, respectively, downstream of the AAS relative to upstream in 2022 versus 2017; however, total concentrations were consistently below BC WQG (Appendix Table E.2). These results are similar to those reported for 2019 and 2021 and the results for molybdenum are not unexpected, given it is a component of the antiscalant compound (Figure 3.1). Overall, it can be concluded that concentrations of mine-related constituents in Lower Greenhills Creek have not undergone unexpected changes relative to upstream following the application of antiscalant.

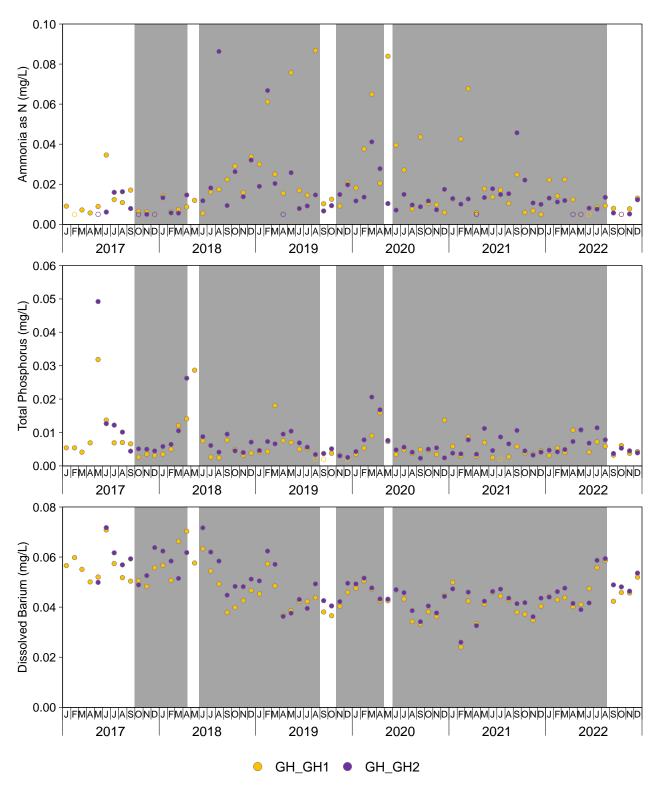
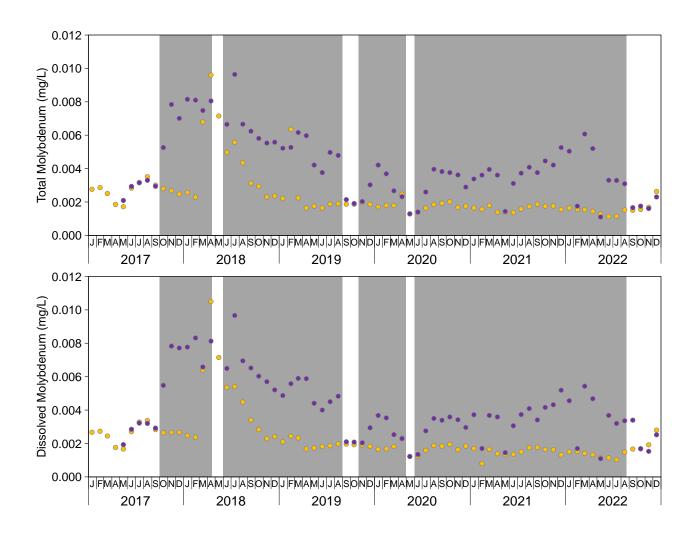


Figure 3.1: Monthly Mean Concentrations of Constituents Showing Significant Differences Before and After Calcite Treatment for Stations Upstream (GH_GH1) and Downstream (GH_GH2) from the Water Treatment Facility, 2017 to 2022

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Grey shading represents prevention–mode calcite treatment.



● GH_GH1 ● GH_GH2

Figure 3.1: Monthly Mean Concentrations of Constituents Showing Significant Differences Before and After Calcite Treatment for Stations Upstream (GH_GH1) and Downstream (GH_GH2) from the Water Treatment Facility, 2017 to 2022

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Grey shading represents prevention–mode calcite treatment.

3.1.3 Greenhills Creek Sedimentation Pond

No stratification was observed within the Greenhills Creek Sedimentation during September 2022 and the list of constituents with concentrations above BC WQG, the CCME guideline for total mercury, EVWQP Benchmarks, proposed benchmarks, updated EC, or screening values was similar to Upper and Lower Greenhills Creek (Section 3.1.2; Appendix Tables E.1 and E.6). Specifically, TDS concentrations were above the Level 1 screening value; sulphate concentrations were above the Level 2 updated EC; and dissolved nickel concentrations were above the Level 1 proposed benchmark (Appendix Table E.1).

The pond water samples from September 2022 had a combined dimethylselenoxide and methylseleninic acid concentration (i.e., 0.197 micrograms per litre [μ g/L]) that was higher relative to all other GC LAEMP and Selenium Speciation Monitoring Program sampling locations in the Greenhills Creek watershed in 2022 (Appendix Table E.4; ADEPT et al. 2023). The draft screening value (0.025 μ g/L) for detectable increases in selenium bioaccumulation was exceeded in the September 2022 sample.

3.2 Substrate Quality

3.2.1 Calcite

3.2.1.1 Gardine Creek

Calcite presence and concretion were lower in Gardine Creek upstream from the seeps GARD1-50, and GARD1-75) in 2022, relative (RG GAUT, to downstream (RG GANF and RG GARD1-25) (Figures 2.2 and 3.2; Tables 3.1 and 3.2; Appendix Tables F.1 and F.2; Smit and Robinson 2023). These results are consistent with previous years of monitoring (i.e., 2019 to 2021) (Figure 3.2; Tables 3.1 and 3.2). Calcite presence (C_p) values for RG GANF in 2022 were also comparable to previous years of monitoring. In 2022, Cp', Cc, Cl, and Cl' values at RG_GANF were higher relative to 2021, but Cc scores were, on average, the lowest recorded at RG GANF since 2019 (Figure 3.2; Tables 3.1 and 3.2).

In 2022, RG_GAUT-1 and RG_GAUT-2 had higher C_p, C_p', CI, and CI' values relative to the upstream stations (RG_GAUT-3 to RG_GAUT-6 and GARD1-75), relative to GARD1-50, and relative to values reported at RG_GAUT-1 and RG_GAUT-2 in previous years (Figures 2.2 and 3.2; Table 3.1). Because the data for RG_GAUT-1 and RG_GAUT-2 were clearly misaligned with the rest of the calcite monitoring data collected upstream from the seeps in 2022, a more thorough review of the field data sheets, Regional Calcite Monitoring Program results, and Teck's activities within the area in 2022 was completed. The C_p, C_p,' CI, and CI' scores were evaluated from upstream-to-downstream along the creek, based on data from the GC LAEMP and Regional Calcite Monitoring Program. It was considered unrealistic that the

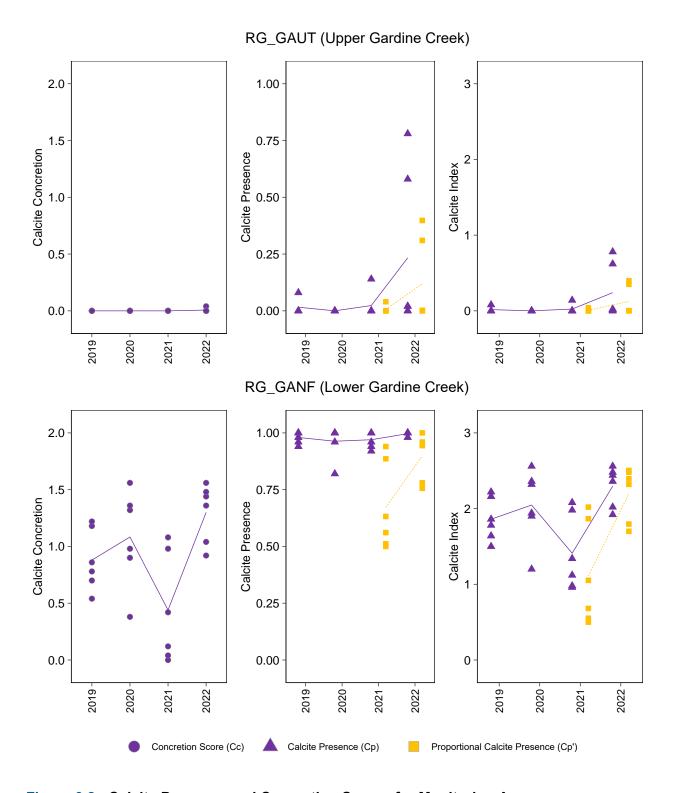


Figure 3.2: Calcite Presence and Concretion Scores for Monitoring Areas on Gardine Creek, 2019 to 2022

Note: In 2021 and 2022, calcite presence was measured using both presence/absence and proportional scoring methods.

Table 3.1: Calcite Indices (CI and CI') for Monitoring Locations on Greenhills and Gardine Creeks, 2015 to 2022

Watercourse	Station ID	UTM Coordinates (NAD83, 11U)				Calcite Index Prime (CI')							
		Easting	Northing	2015	2016	2017	2018	2019	2020	2021	2022	2021	2022
	RG_GAUT-6	653321	5549045	ı	ı	-	-	0	0	0	0	0	0
	RG_GAUT-5	653346	5549023	-	-	-	-	0	0	0	0.02	0	0
	RG_GAUT-4	653379	5548991	-	-	-	-	0	0	0	0	0	0
	RG_GAUT-3	653392	5548984	-	-	-	-	0	0	0	0.02	0	0
	RG_GAUT-2	653431	5548953	ı	ï	-	-	0.08	0	0	0.78	0	0.40
	RG_GAUT-1	653451	5548928	-	-	-	-	0.04	0	0.14	0.62	0.04	0.35
	GARD1-75	653316			0.14	0.60				0	0	0	0
Gardine Creek	GARD1 a GARD1-50	653641	5548601	0.32			0.64	0.50	0.60	0	0	0	0
I	GARD1-25	653316	5549076							2.2	1.7	2.1	1.6
	RG_GANF-6	654125	5547829	-	-	-	-	1.8	1.9	2.0	2.4	1.9	2.3
	RG_GANF-5	654186	5547833	-	-	-	-	1.5	2.4	2.1	2.5	2.0	2.4
	RG_GANF-4	654204	5547822	-	-	-	-	2.2	2.3	1.3	1.9	1.1	1.7
	RG_GANF-3	654234	5547802	-	-	-	-	1.9	1.9	0.98	2.6	0.55	2.5
	RG_GANF-2	654247	5547794	-	-	-	-	2.2	2.6	0.96	2.4	0.50	2.4
	RG_GANF-1	654277	5547746	-	-	-	-	1.6	1.2	1.1	2.0	0.67	1.8
	RG_GHUT-6	654138	5550027	-	-	2.2	2.8	2.9	2.2	1.9	2.8	1.8	2.8
	RG_GHUT-5	654127	5549988	-	-	1.7	2.5	2.6	2.5	1.7	2.2	1.7	2.2
	RG_GHUT-4	654134	5549945	-	-	1.1	2.3	2.9	2.6	2.3	2.7	2.2	2.7
	RG_GHUT-3	654123	5549927	-	-	2.7	2.8	3.0	2.5	1.6	3.0	1.5	3.0
	GREE4-75	654152	5549910	2.8	2.5	2.3	2.6	2.3	2.7	2.7	2.6	2.7	2.6
	RG_GHUT-2	654145	5549895	-	-	2.8	2.5	2.9	2.6	1.6	2.3	1.6	2.3
	RG_GHUT-1	654149	5549848	-	-	2.3	2.8	2.5	2.4	2.7	2.4	2.7	2.4
Upper	RG_GH-CTF	654165	5549540	-	2.6	-	-	-	-	-	-	-	-
Greenhills	GREE4-62.5	654195	5549512	2.7	-	-	-	-	-	-	-	-	-
Creek	RG_GHNF-6	654336	5549159	-	-	2.8	2.6	3.0	2.9	2.2	2.5	2.2	2.5
	GREE4-50	654336	5549133	2.9	2.6	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8
	RG_GHNF-5	654342	5549130	-	-	3.0	2.5	3.0	2.6	1.9	2.6	1.9	2.6
	RG_GHNF-4	654335	5549104	-	-	2.3	2.4	2.9	2.9	2.5	2.4	2.5	2.4
	RG_GHNF-3	654367	5549052	1	-	3.0	2.7	2.9	2.7	2.2	2.4	2.2	2.4
	RG_GHNF-2	654375	5549036	-	-	2.9	2.7	3.0	2.5	1.9	2.5	1.9	2.5
	RG_GHNF-1	654384	5549004	-	-	3.0	2.8	3.0	2.8	2.4	2.5	2.4	2.5
	GREE4-37.5	654447	5548758	2.8	-	-	-	-	-	-	-	-	-



Notes: ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum; - = no data; ≥ = greater than or equal to.

^a From 2015 to 2020, data for Reach 1 of Gardine Creek were reported as an average of three stations. In 2021 and 2022, the data were reported for individual stations.

Table 3.1: Calcite Indices (CI and CI') for Monitoring Locations on Greenhills and Gardine Creeks, 2015 to 2022

Watercourse	Station ID	UTM Coordinates (NAD83, 11U)				Calcite Index Prime (CI')							
		Easting	Northing	2015	2016	2017	2018	2019	2020	2021	2022	2021	2022
	RG_GHDT-6	654288	5547720	-	-	-	-	-	-	-	2.7	-	2.7
	RG_GHDT-5	654288	5547720	-	-	-	-	-	-	-	2.9	-	2.9
	RG_GHDT-4	654288	5547720	-	-	-	-	-	-	-	2.7	-	2.7
	RG GHDT-3	654288	5547720	-	-	-	-	-	-	-	2.6	-	2.6
	RG_GHDT-2	654288	5547720	_	-	-	-	-	-	-	3.0	-	3.0
	RG GHDT-1	654288	5547720	_	_	_	_	_	_	_	2.6	_	2.6
	GREE4-25	654512	5548365	2.8	2.7	2.8	2.8	1.8	2.9	2.6	2.8	2.6	2.8
	GRE-CA06	654451	5548079		2.6	-	_	-	-	-	-	-	-
Upper	GREE4-12.5	654393	5547996	2.9	-	-	-	-	-	-	-	-	-
Greenhills	RG GHFF-6	654181	5547271	-	-	2.0	2.7	2.6	2.0	2.5	2.9	2.4	2.9
Creek	RG GHFF-5	654187	5547244	-	-	2.4	2.7	2.6	2.5	2.7	2.6	2.5	2.5
	GREE3-75	654172	5547243	2.5	2.4	2.7	2.5	1.6	2.6	2.7	2.9	2.7	2.9
	RG_GHFF-4	654161	5547200	-	-	2.2	2.5	2.8	2.5	2.6	2.6	2.6	2.6
	RG_GHFF-3	654135	5547185	-	-	1.8	2.6	2.8	2.5	2.3	2.2	2.2	2.2
	RG_GHFF-2	654118	5547137	-	-	2.0	2.5	2.2	2.2	2.7	2.3	2.6	2.3
	RG_GHFF-1	654099	5547120	-	-	2.6	2.6	2.2	2.3	2.2	2.8	2.0	2.8
	GREE3-62.5	654048	5547076	2.7	-	-	-	-	-	-	-	-	-
	GREE3-50	653990	5546883	2.5	2.4	2.5	2.5	2.3	2.6	2.9	2.7	2.9	2.7
	GREE3-37.5	653954	5546673	2.2	-	-	-	-	-	-	-	-	-
	GREE3-25	653918	5546481	2.6	1.7	2.4	2.4	1.8	2.5	2.4	2.3	2.4	2.3
	GH_DSAF	653543	5545805	-	-	-	1.5	-	-	-	-	-	-
	RG_GHBP-6	653547	5545677	-	2.4	2.4	2.1	2.0	1.9	1.2	1.8	1.0	1.7
	GH_GREE1-75	653534	5545668	1.4	2.1	2.1	1.4	1.2	1.3	1.2	1.3	1.2	1.2
1	RG_GHBP-5	653538	5545647	-	1.9	1.9	1.4	1.4	1.1	0.92	1.5	0.44	1.3
Lower Greenhills	RG_GHBP-4	653538	5545628	-	0.72	0.72	1.6	0.76	0.50	0.90	1.0	0.42	0.83
-	RG_GHBP-3	653521	5545623	-	0.68	0.68	0.24	0.62	0.42	0.90	0.90	0.45	0.27
Creek	RG_GHBP-2	653513	5545618	-	0.52	0.52	0.40	0.54	0.64	0.90	0.08	0.47	0.04
	RG_GHBP-1	653501	5545593	-	0.30	0.30	0.32	0.72	0.30	0.86	0.18	0.36	0.06
	GH_GREE1-50	653494	5545590	0.88	0.90	0.90	0.26	0.54	0.11	1.0	1.0	0.26	0.22
	GH_GREE1-25	653386	5545504	0.30	0.23	0.23	0.23	0.21	0.47	1.1	1.0	0.86	0.30



Notes: ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum; - = no data; ≥ = greater than or equal to.

^a From 2015 to 2020, data for Reach 1 of Gardine Creek were reported as an average of three stations. In 2021 and 2022, the data were reported for individual stations.

Table 3.2: Calcite Concretion Scores for Stations on Greenhills and Gardine Creeks, 2015 to 2022

Watercourse	Station ID		ordinates	2045	2046	2017	2018	2019	2020	2021	2022
	Station iD	Easting	3, 11U) Northing	2015	2016	2017	2010			2021	2022
	RG GAUT-6	653321	5549045	_	_	_	_	0	0	0	0
	RG GAUT-5	653346	5549023	_	_	_	_	0	0	0	0
	RG GAUT-4	653379	5548991	-	-	-	-	0	0	0	0
	RG_GAUT-3	653392	5548984	-	-	-	-	0	0	0	0
	RG_GAUT-2	653431	5548953	-	-	-	-	0	0	0	0
	RG_GAUT-1	653451	5548928	-	-	-	-	0	0	0	0.04
	GARD1-75	653316	5549076							0	0
Gardine Creek	GARD1 ^a GARD1-50	653641	5548601	0.06	0.02	0.28	0.29	0.01	0.22	0	0
	GARD1-25	653316	5549076							1.2	0.74
1	RG_GANF-6	654125	5547829	-	-	-	-	0.78	0.90	0.98	1.4
	RG_GANF-5	654186	5547833	-	-	-	-	0.54	1.4	1.1	1.5
	RG_GANF-4	654204	5547822	-	-	-	-	1.2	1.3	0.42	0.92
	RG_GANF-3 RG_GANF-2	654234	5547802	-	-	-	-	0.86	0.98	0.04	1.6
	RG_GANF-2 RG_GANF-1	654247 654277	5547794	-	-	-	-	1.2	1.6	0.12	1.4
	_		5547746	-	-	1.2	1.5	0.70	0.38		
	RG_GHUT-6	654138	5550027	-	-			1.9	1.3	0.88	1.8
	RG_GHUT-5	654127	5549988	-	-	0.70	1.5	1.6	1.5	0.70	1.2
	RG_GHUT-4	654134	5549945	-	-	0.08	1.3	1.9	1.6	1.3	1.7
	RG_GHUT-3	654123	5549927	-	-	1.7	1.8	2.0	1.5	0.60	2.0
	GREE4-75	654152	5549910	1.8	1.5	1.4	1.6	1.3	1.8	1.7	1.6
	RG_GHUT-2	654145	5549895	-	-	1.8	1.5	1.9	1.6	0.64	1.4
l	RG_GHUT-1	654149	5549848	-	-	1.3	1.8	1.5	1.4	1.7	1.4
Upper Greenhills	GREE4-62.5	654195	5549512	1.8	-	-	-	-	-	-	-
Creek	RG_GHNF-6	654336	5549159	-	-	1.8	1.6	2.0	1.9	1.2	1.5
0.00	GREE4-50	654336	5549133	1.9	1.7	1.9	1.9	1.9	1.9	1.8	1.8
	RG_GHNF-5	654342	5549130	-	-	2.0	1.5	2.0	1.6	0.88	1.6
	RG_GHNF-4	654335	5549104	-	-	1.3	1.4	1.9	1.9	1.5	1.4
	RG_GHNF-3	654367	5549052	-	-	2.0	1.7	1.9	1.7	1.2	1.4
	RG_GHNF-2	654375	5549036	-	-	1.9	1.7	2.0	1.5	0.86	1.5
	RG_GHNF-1	654384	5549004	-	-	2.0	1.8	2.0	1.8	1.4	1.5
	GREE4-37.5	654447	5548758	1.8		-	-	-	-	-	-



Notes: ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum; - = no data.

^a From 2015 to 2020, data for Reach 1 of Gardine Creek were reported as an average of three stations. In 2021 and 2022, the data were reported for individual stations.

Table 3.2: Calcite Concretion Scores for Stations on Greenhills and Gardine Creeks, 2015 to 2022

Watercourse	Station ID	UTM Coordinates (NAD83, 11U)		2015	2016	2017	2018	2019	2020	2021	2022
		Easting	Northing								
	GREE4-25	654512	5548365	1.8	1.7	1.8	1.8	0.81	1.9	1.6	1.8
	GREE4-12.5	654393	5547996	1.9	-	-	-	-	-	-	-
	RG_GHDT-6	654288	5547720	-	-	-	-	-	-	-	1.7
Ī	RG_GHDT-5	654288	5547720	-	-	-	-	-	-	-	1.9
Ī	RG_GHDT-4	654288	5547720	-	-	-	-	-	-	-	1.7
Ī	RG_GHDT-3	654288	5547720	-	-	-	-	-	-	-	1.6
Ī	RG_GHDT-2	654288	5547720	-	-	-	-	-	-	-	2.0
Ī	RG_GHDT-1	654288	5547720	-	-	-	-	-	-	-	1.6
Upper	RG_GHFF-6	654181	5547271	-	-	0.96	1.7	1.6	0.98	1.5	1.9
Greenhills	RG_GHFF-5	654187	5547244	-	-	1.4	1.7	1.6	1.5	1.7	1.6
Creek	GREE3-75	654172	5547243	1.6	1.5	1.7	1.6	0.64	1.6	1.7	1.9
Ī	RG_GHFF-4	654161	5547200	-	-	1.2	1.5	1.8	1.5	1.6	1.6
Ī	RG_GHFF-3	654135	5547185	-	-	0.80	1.6	1.8	1.5	1.3	1.2
Ī	RG_GHFF-2	654118	5547137	-	-	1.0	1.5	1.2	1.2	1.7	1.3
Ī	RG_GHFF-1	654099	5547120	-	-	1.6	1.6	1.4	1.3	1.3	1.8
Ī	GREE3-62.5	654048	5547076	1.7	-	-	-	-	1.5	-	-
Ī	GREE3-50	653990	5546883	1.6	1.4	1.5	1.5	1.3	1.6	1.9	1.7
Ī	GREE3-37.5	653954	5546673	1.3	-	-	-	-	1.6	-	-
Ī	GREE3-25	653918	5546481	1.6	0.84	1.5	1.4	0.81	1.5	1.4	1.3
	GH_DSAF	653543	5545805	-	-	-	0.70	-	-	-	-
Ī	RG_GHBP-6	653547	5545677	-	-	1.4	1.1	1.0	1.1	0.24	0.88
Ī	GH_GREE1-75	653534	5545668	0.10	0.61	1.1	0.57	0.28	0.39	0.18	0.28
	RG_GHBP-5	653538	5545647	-	-	0.90	0.44	0.50	0.30	0	0.48
Lower	RG_GHBP-4	653538	5545628	-	-	0	0.64	0.08	0.02	0	0.06
Greenhills Creek	RG_GHBP-3	653521	5545623	-	-	0	0	0	0	0	0
Olock	RG_GHBP-2	653513	5545618	-	-	0	0.02	0	0.04	0	0
ļ	RG_GHBP-1	653501	5545593	-	-	0	0	0	0	0	0
	GH_GREE1-50	653494	5545590	0.02	0.20	0.14	0.03	0	0	0	0
	GH_GREE1-25	653386	5545504	0	0	0.02	0	0	0	0.05	0



Notes: ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum; - = no data.

^a From 2015 to 2020, data for Reach 1 of Gardine Creek were reported as an average of three stations. In 2021 and 2022, the data were reported for individual stations.

calcite scores for the two downstream-most stations at RG_GAUT (i.e., RG_GAUT-1 and RG_GAUT-2) would exhibit such large differences relative to the next upstream stations (e.g., RG_GAUT-3 and RG_GAUT-4) and relative to the Regional Calcite Monitoring Program stations (GARD1-50 and GARD1-75) (see Table 3.1). Additionally, there were no upstream activities in 2022 that could explain why more calcium carbonate would be present in this section of Gardine Creek in 2022. For these reasons, and in consideration of the absence of changes over time in the regional data set and expected timelines for calcite deposition and concretion, it is considered highly likely that the 2022 calcite data for RG_GAUT-1 and RG_GAUT-2 were not recorded correctly and are unreliable. Calcite monitoring planned for September 2023 is expected to confirm whether C_p, C_p', CI, and CI' values for RG_GAUT-1 and RG_GAUT-2 are, in reality, more like those recorded historically (i.e., from 2019 to 2021) or if values are in fact increasing (as recorded in 2022).

3.2.1.2 Upper and Lower Greenhills Creek

Calcite measurements completed in 2022 indicated that calcified substrates were present throughout Upper Greenhills Creek and, to a lesser extent, in Lower Greenhills Creek (Figure 3.3; Table 3.1; Appendix Tables F.3 to F.7). Calcite presence (C_p) and CI values were significantly lower downstream from the historical (i.e., October 2017 to August 2022) AAS location on Lower Greenhills Creek relative to upstream (Table 3.2; Appendix Table F.8).

Overall, C_p values for RG_GHUT, RG_GHNF, and RG_GHFF on Upper Greenhills Creek and RG_GHBP on Lower Greenhills Creek have remained fairly consistent since 2017, but C_c values have changed over time within individual monitoring areas (Figures 2.2 and 3.3; Appendix Table F.8). Most importantly, C_c values for RG_GHBP on Lower Greenhills Creek showed signs of improvement starting in 2019 and were consistently and significantly lower (i.e., by 39 to 90%) throughout 2020 to 2022 relative to 2017 (Appendix Table F.8). The improvement in C_c values for RG_GHBP is attributed to successful treatment with antiscalant between October 2017 and August 2022.

3.2.2 Sediment Chemistry

3.2.2.1 Gardine Creek

Concentrations of cadmium and nickel in bulk sediments from upper (RG_GAUT) and lower (RG_GANF) Gardine Creek were within reference area normal ranges but consistently above the lower BC WSQG in 2022 (Figure 3.4; Appendix Table F.9). Results of the SEA indicated guideline exceedances for cadmium and nickel were associated with the potentially mobile sediment fractions (i.e., sediment fractions 1 to 4; Figures 3.5 and 3.6; Appendix Tables F.10

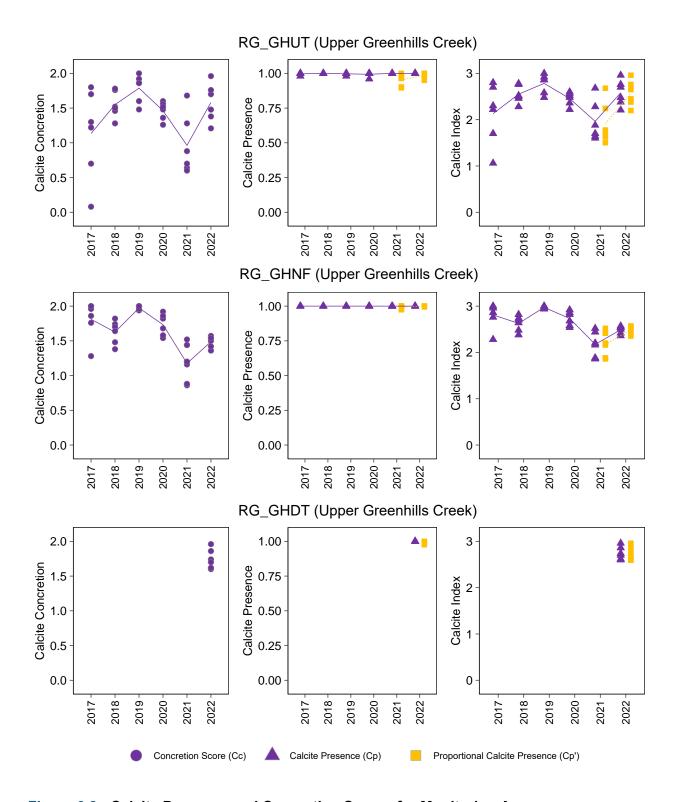


Figure 3.3: Calcite Presence and Concretion Scores for Monitoring Areas on Greenhills Creek, 2017 to 2022

Note: In 2021 and 2022, calcite presence was measured using both presence/absence and proportional scoring methods.

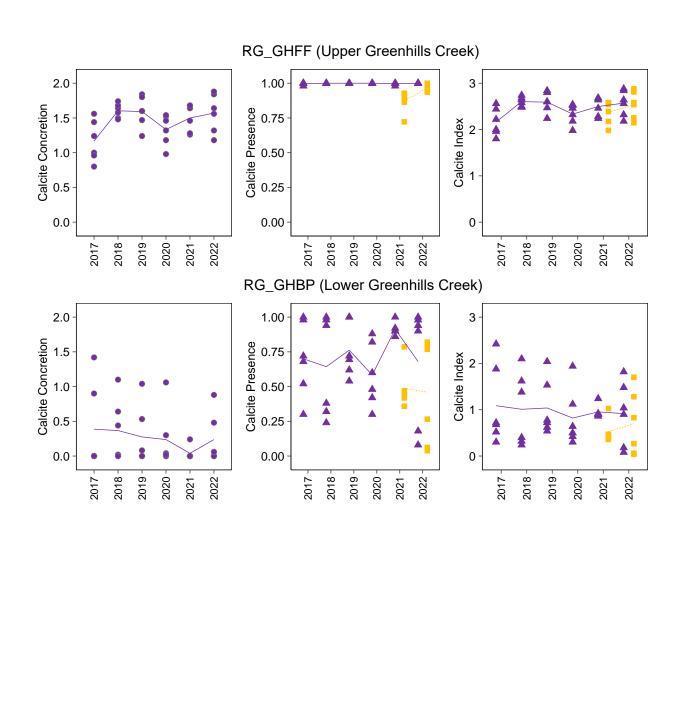


Figure 3.3: Calcite Presence and Concretion Scores for Monitoring Areas on Greenhills Creek, 2017 to 2022

Concretion Score (Cc)

Note: In 2021 and 2022, calcite presence was measured using both presence/absence and proportional scoring methods.

Calcite Presence (Cp)

Proportional Calcite Presence (Cp')

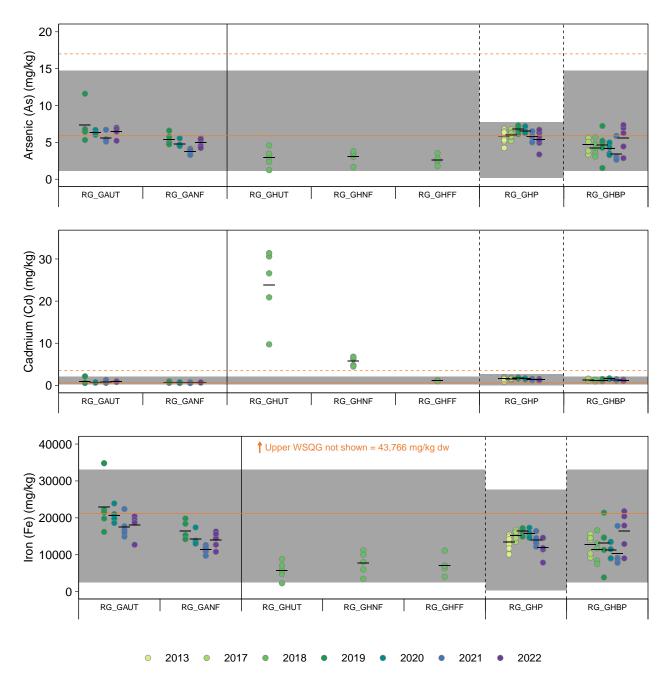


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

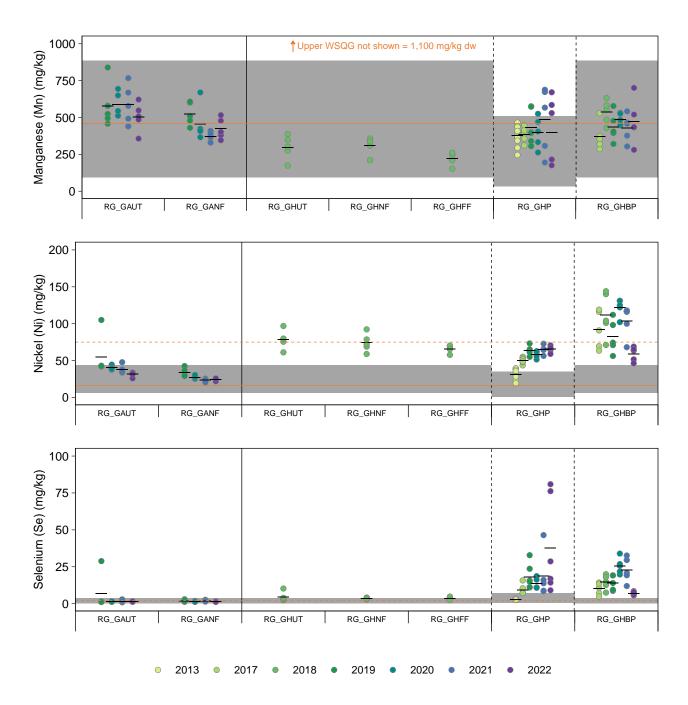


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

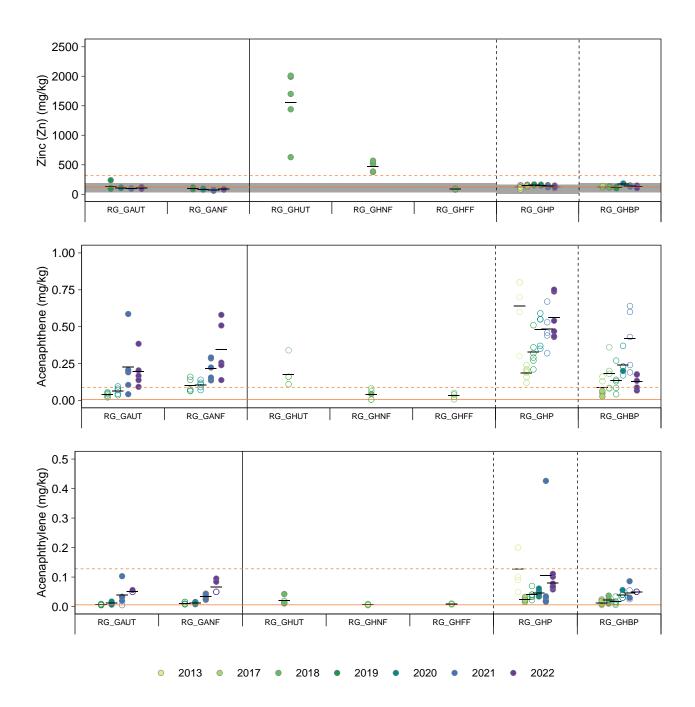


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

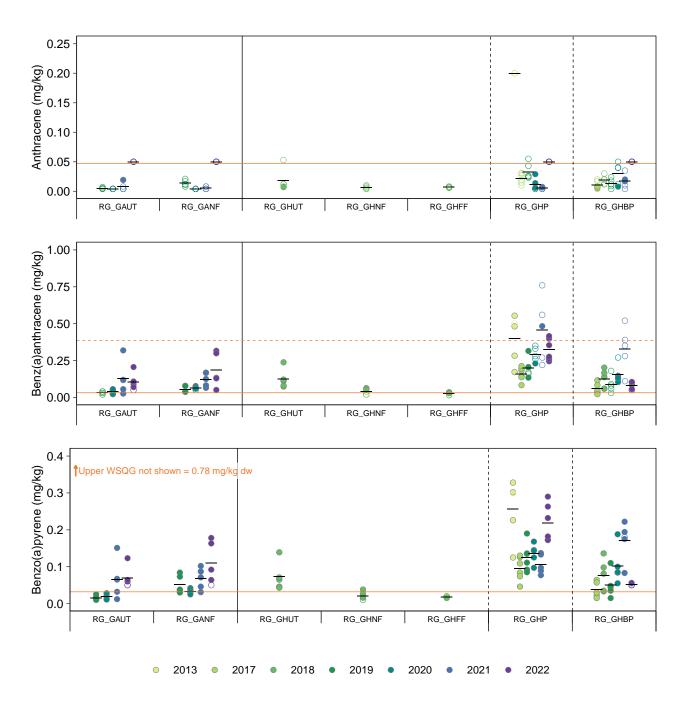


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

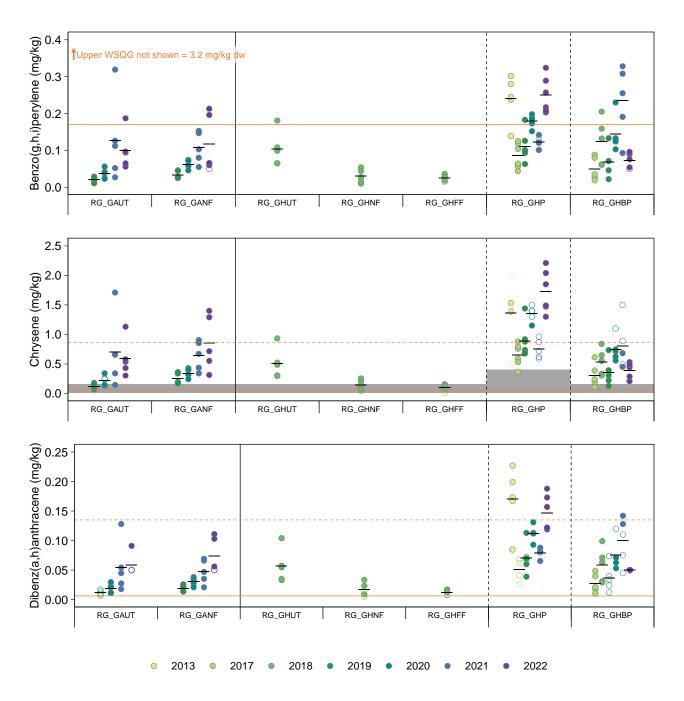


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

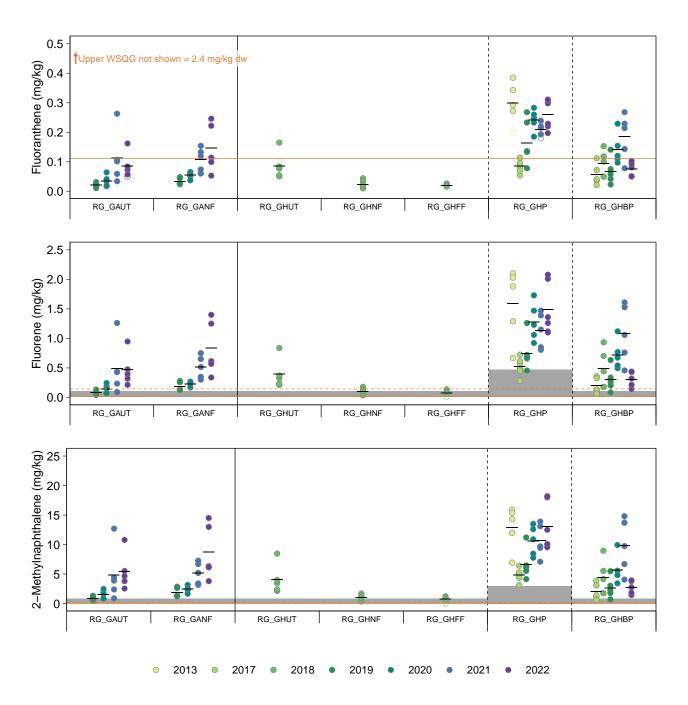


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

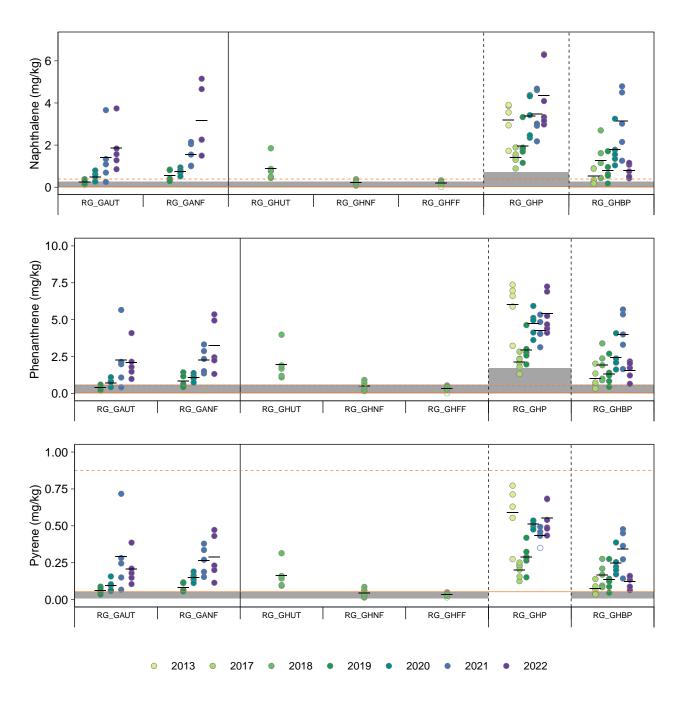


Figure 3.4: Concentrations of Analytes that Exceeded Sediment Quality Guidelines or the Alert Concentration for Selenium, Greenhills Creek, Gardine Creek, and Greenhills Creek Sedimentation Pond, September 2013 to 2022

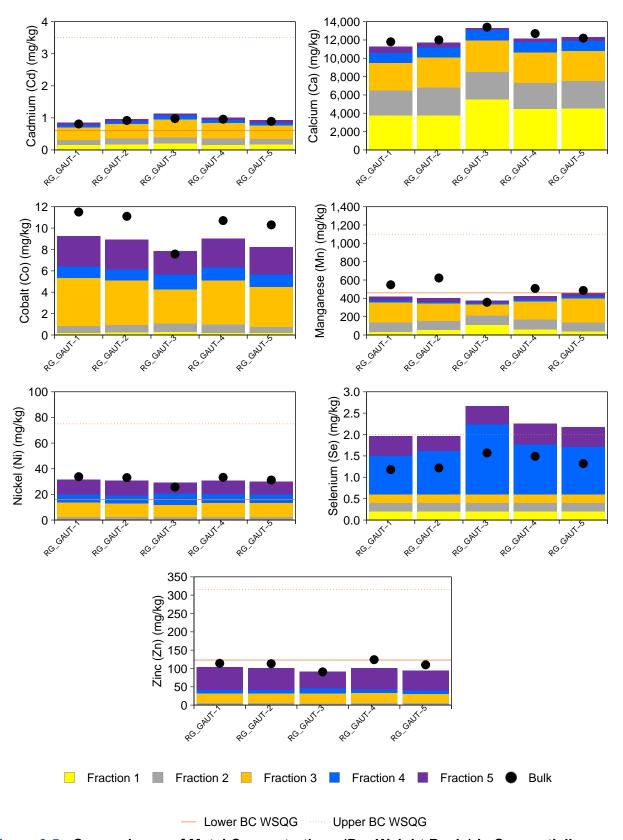


Figure 3.5: Comparisons of Metal Concentrations (Dry Weight Basis) in Sequentially Extracted Sediment Fractions to British Columbia Working Sediment Quality Guidelines, Upper Gardine Creek (RG_GAUT), 2022

Notes: mg/kg = milligrams per kilogram dry weight; BC WSQG = British Columbia Working Sediment Quality Guideline. Values at the Laboratory Reporting Limit (LRL) were plotted at the LRL. Concentrations were determined using Tessier Extraction (Tessier et al. 1979).

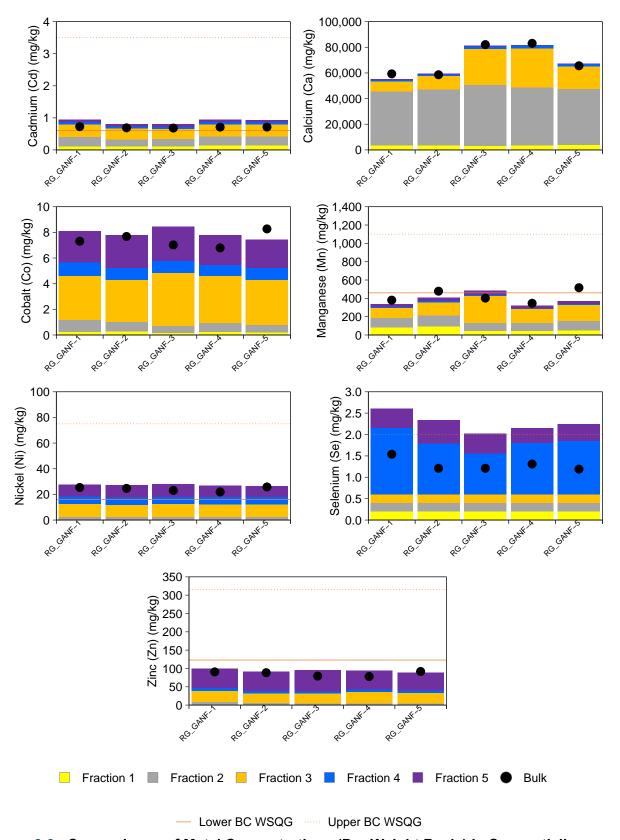


Figure 3.6: Comparisons of Metal Concentrations (Dry Weight Basis) in Sequentially Extracted Sediment Fractions to British Columbia Working Sediment Quality Guidelines, Lower Gardine Creek (RG_GANF), 2022

Notes: mg/kg = milligrams per kilogram dry weight; BC WSQG = British Columbia Working Sediment Quality Guideline. Values at the Laboratory Reporting Limit (LRL) were plotted at the LRL. Concentrations were determined using Tessier Extraction (Tessier et al. 1979).

to F.19).²⁰ Concentrations of arsenic (RG_GAUT), manganese (RG_GAUT and RG_GANF), and zinc (RG_GAUT) in bulk sediments were occasionally (i.e., in one to four of n = 5 samples per area) above the lower BC WSQG, despite concentrations being consistently within reference area normal ranges (Figure 3.4; Appendix Table F.9). However, concentrations of these metals in the potentially mobile sediment fractions were less than the lower BC WSQG (Figures 3.5 and 3.6; Appendix Tables F.10 to F.19). Based on the above comparisons, it appears that potentially bioavailable concentrations of arsenic, manganese, and zinc in sediments from Gardine Creek are low enough that adverse biological effects would not be expected under most circumstances (BCMOECCS 2021b). In contrast, bioavailable concentrations of cadmium and nickel in sediments are more likely to be associated with potential adverse effects.

Concentrations of PAHs in sediments from Gardine Creek were frequently above the lower BC WSQG and concentrations of acenaphthene, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene were consistently above the upper BC WSQG in 2022 (Figure 3.4; Appendix Table F.9). Additionally, concentrations of chrysene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene were above their respective reference area normal ranges at RG_GAUT and RG_GANF in 2022, consistent with 2021 (Figure 3.4; Minnow 2022a).

Bulk sediment samples collected from RG_GANF (downstream) in 2022 had lower concentrations of most metals relative to RG_GAUT (upstream), despite having similar TOC content, higher clay content (magnitude of difference [MOD] = 110%), and less coarse sand and gravel relative to RG_GAUT (Figure 3.4; Appendix Table F.20) (e.g., Horowitz 1991; Zhang et al. 2014). The bulk sediment samples from RG_GANF did however have higher concentrations of calcium (MOD = 499%) relative to RG_GAUT, consistent with the higher incidence of calcite presence at RG_GANF (see Section 3.2.1). The spatial patterns in metal concentrations within bulk sediments were reflected in the comparisons of SEA results between RG_GAUT and RG_GANF (Appendix Table F.21). Other than concentrations of benzo(k)fluoranthene being higher (MOD = 162%) at RG_GANF relative to RG_GAUT, no statistically significant differences in concentrations of PAHs were identified between the two Gardine Creek stations in 2022 (Appendix Table E.20).

In 2022, concentrations of metals in bulk sediment samples from Gardine Creek were generally lower than or comparable to previous years, whereas concentrations of PAHs were substantially higher relative to 2019 and 2020 (Figure 3.4; Appendix Table F.22). The higher PAH concentrations in the sediments from RG GAUT (upstream) may be partially attributed to the

²⁰ Comparison of the sum of sediment fractions 1 to 4 to the BC WSQG is considered to be a conservative screening of the potentially mobile, and therefore potentially bioavailable, sediment constituents. It would take highly unusual/aggressive reducing and oxidizing conditions, respectively, to mobilize fractions 3 and 4 and these conditions are not likely to occur in the Greenhills Creek watershed.



higher TOC (MODs = 78 and 115%) and fine silt (MODs = 76 and 187%) content in 2022 relative to 2019 and 2020 (Figure 3.4; Appendix Table F.22) (e.g., Christensen 1998; Shi et al. 2007). Similarly, the higher PAH concentrations observed at RG_GANF (downstream) in 2022 versus 2019 and 2020 may be attributed to the higher TOC (MODs = 78 and 82%) and clay (MODs = 144 and 165%) content in 2022 (Appendix Table F.22). However, this interpretation is complicated by the absence of statistically significant differences in PAH concentrations at RG_GAUT in 2021 and 2022, despite the sediment samples from 2022 having higher TOC (MOD = 79%) and fine silt (MOD = 84%) relative to 2021 (Appendix Table F.22). A similar phenomenon was also observed for RG_GANF when evaluating PAH concentrations relative to TOC and sediment particle sizes (Appendix Table F.22).

The SEA results for Gardine Creek indicate that metal concentrations in individual sediment fractions may differ from year to year (i.e., in conjunction with changes in bulk concentrations), but the distribution of metals among the fractions is generally consistent over time (Figures 3.5 and 3.6; Appendix Table F.23). Relatively few exceptions were identified for constituents that had guideline exceedances based on concentrations in the potentially mobile sediment fractions (i.e., cadmium and nickel). Specifically, at RG_GAUT, there was more cadmium distributed within sediment fractions 3 (easily reducible/bound to iron and manganese oxides) and 4 (organic-bound) versus fraction 5 (residual) in 2022 relative to 2019 and 2020. Additionally, for the samples collected from RG_GANF in 2022, there was more nickel distributed within fraction 3 versus fraction 2 (carbonate) relative to 2021 (Figures 3.5 and 3.6; Appendix Table F.23).

Overall, the distribution of constituent concentrations among the sediment fractions has been comparable among years. Therefore, as discussed in the May 2022 and 2023 meetings with the EMC, adding to the existing multi-year data set for SEA analyses is not expected to provide additional information. Bulk sediment chemistry results are considered sufficient to address study questions and evaluate changes over time and among areas. Therefore, upcoming cycles of the GC LAEMP will continue to include bulk sediment chemistry analyses and SEA will be discontinued starting in 2023.

The SQI calculated for RG_GAUT (upstream) and RG_GANF (downstream) on Gardine Creek in 2022 were low (on a scale of 0 to 100) and therefore indicative of poor sediment quality, consistent with previous years of monitoring (Appendix Table F.24). The SQI were also lower than SQI for most lotic sampling areas included in the 2017 to 2019 RAEMP report (Minnow 2020b). Similar to the 2021 results for the GC LAEMP, the scope and frequency of BC WSQG exceedances were higher at RG_GAUT than RG_GANF, but the amplitude of exceedances was similar between the two areas (Minnow 2022a).

3.2.2.2 Lower Greenhills Creek

Bulk sediment samples collected from Lower Greenhills Creek in 2022 had cadmium and nickel concentrations that were consistently above the lower BC WSQG, selenium concentrations that were consistently above the alert concentration, and multiple PAHs with concentrations above reference area normal ranges and the lower or upper BC WSQG (Figure 3.4; Appendix Table F.9). At least one of the bulk sediment samples collected from Lower Greenhills Creek in 2022 also had concentrations of arsenic, iron, manganese, or zinc that exceeded the lower BC WSQG, despite being within reference area normal ranges (Figure 3.4; Appendix Table F.9). Results of the SEA for metals, however, indicated that guideline/alert concentration exceedances within the potentially mobile sediment fractions (i.e., fractions 1 to 4) were restricted to cadmium, nickel, and selenium (Figure 3.7; Appendix Tables F.25 to F.29). Therefore, metal concentrations reported in bulk sediments provide a conservative (i.e., overestimation) of the bioavailable fractions of some metals and potential risks to aquatic organisms (e.g., benthic invertebrates, fish).

Comparisons among areas highlighted some patterns in metal and PAH concentrations that may be attributable to RG_GHBP being downstream from the Greenhills Creek Sedimentation Pond and differences in sediment composition (Figure 2.3). For example, selenium concentrations in sediments from RG_GHBP were less than in the pond (MOD = 75%) but higher relative to Gardine Creek (MODs = 80 and 81%) in 2022 (Figure 3.4; Appendix Table F.20). This pattern may be attributed to carry-over effects of selenium cycling within the pond, as well as the creek samples having less fine silt, clay, and TOC than the pond samples (Appendix Table F.20; e.g., Zhang et al. 2014). Concentrations of most PAHs in bulk sediments from Lower Greenhills Creek were lower relative to the pond (MODs = 73 to 83%, depending on the constituent) in 2022, and, again, this is likely attributed to the sediments from Lower Greenhills Creek having less fine silt and clay (Figure 3.4; Appendix Table F.20).

In 2022, concentrations of metals and PAHs in bulk sediment samples from Lower Greenhills Creek were generally lower than or comparable to previous years (Figure 3.4; Appendix Table F.23). The limited number of exceptions included:

- higher arsenic, molybdenum, tin, and titanium concentrations in 2022 relative to 2021;
- higher acenaphthylene concentrations in 2022 relative to 2020; and
- higher lithium concentrations in 2022 relative to 2019 and 2021.

The distribution of various metals among sediment fractions 1 to 5 exhibited more temporal variability within Lower Greenhills Creek relative to Gardine Creek (Appendix Table F.23). However, nickel and selenium were among the exceptions; concentrations in individual sediment

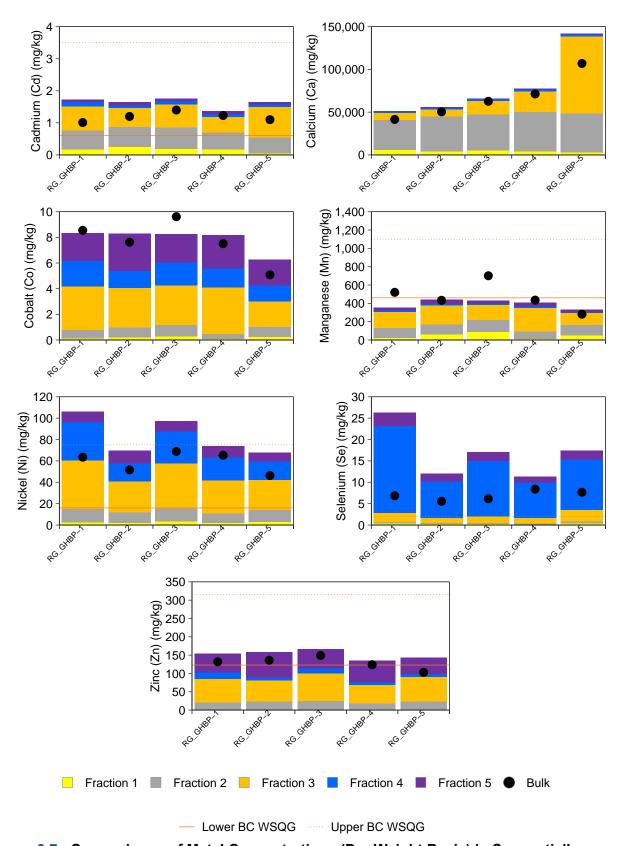


Figure 3.7: Comparisons of Metal Concentrations (Dry Weight Basis) in Sequentially Extracted Sediment Fractions to British Columbia Working Sediment Quality Guidelines, Lower Greenhills Creek (RG_GHBP), 2022

Notes: mg/kg = milligrams per kilogram dry weight; BC WSQG = British Columbia Working Sediment Quality Guideline. Values at the Laboratory Reporting Limit (LRL) were plotted at the LRL. Concentrations were determined using Tessier Extraction (Tessier et al. 1979).

fractions increased or decreased in conjunction with bulk concentrations without there being "trade-offs" among the sediment fractions (Appendix Table F.23).

Concentrations of manganese and most PAHs²¹ in bulk sediments collected from Lower Greenhills Creek were higher throughout the period of antiscalant addition (i.e., from 2018 to 2022) relative to before treatment began (i.e., 2017) (Appendix Table F.30). Concentrations of boron, mercury, selenium, sodium, titanium, uranium, zinc, and dibenz(a,h)anthracene were also higher in one or two of the post-treatment years relative to 2017. Although some of the MODs for the "after" versus "before" treatment periods are relatively large (i.e., >100%), there is still some uncertainty as to whether observed increases are attributable to water treatment or some combination of factors that may or may not include water treatment. For example, the sediments in the Greenhills Creek Sedimentation Pond have accumulated higher concentrations of PAHs relative to lotic habitats (Appendix Table F.20). Activities or events that disturb and resuspend sediments within the pond (e.g., dredging to remove sediments, overfilling of the pond, and heavy precipitation events) can lead to flushina of PAH-laden sediments lotic environments downstream (e.g., Crane et al. 2010).

Similar to Gardine Creek (Section 3.2.2.1), the SQI for Lower Greenhills Creek in 2022 was indicative of poor sediment quality and was lower relative to other lotic areas evaluated in the 2017 to 2019 RAEMP report (Appendix Table F.24; Minnow 2020b). However, qualitatively, the SQI for Lower Greenhills Creek in 2022 appears to represent an improvement over 2018 to 2021, potentially owing to the lower frequency and/or amplitude of BC WSQG exceedances in 2022 relative to years prior (Appendix Table F.24).

It is noteworthy that although elevated concentrations of some metals and PAHs were identified in Lower Greenhills Creek (and Gardine Creek; see Section 3.2.2.1), sediment in erosional, lotic systems is not generally considered to be a primary pathway for aquatic effects. Sediment and fines generally accumulate in small deposits near banks and pools in lotic systems. As such, changes in the bioavailability of constituents in the sediment in Lower Greenhills or Gardine creeks is not anticipated to have the same biological impact as would be expected from changes in water quality.

3.2.2.3 Greenhills Creek Sedimentation Pond

Within bulk sediments from the Greenhills Creek Sedimentation Pond, cadmium and nickel concentrations were consistently above the lower BC WSQG, selenium concentrations were consistently above the alert concentration, and multiple PAHs had concentrations above the lower

²¹ I.e., benzo[a]pyrene, benzo[b&j]fluoranthene, benzo[e]pyrene, benzo[g,h,i]perylene, fluoranthene, fluorene, indeno[1,2,3-c,d]pyrene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and pyrene.



(e.g., benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, fluoranthene, and pyrene) or upper (e.g., acenaphthene, chrysene, 2-methylnaphthalene, naphthalene, and phenanthrene) BC WSQG (Figure 3.4; Appendix Table F.9). Concentrations of arsenic, manganese, and zinc in bulk sediment samples were also occasionally (i.e., in two to four of the n = 6 samples) above the lower BC WSQG (Figure 3.4; Appendix Table F.9). Results of the SEA analysis indicated that guideline/alert concentration exceedances for cadmium, manganese, nickel, and selenium were mobile sediment associated with the potentially fractions (Figure Appendix Tables F.31 to F.36). Potentially bioavailable concentrations of arsenic and zinc were below concentrations at which adverse biological effects might be expected.

Cadmium, nickel, and selenium concentrations in bulk sediments from the pond were higher relative to Gardine Creek (MODs = 33 to 95%, depending on the constituent) and selenium concentrations were higher relative to Lower Greenhills Creek (Appendix Table E.20; see also Section 3.2.2.2). Nickel and selenium concentrations in sediment samples from the Greenhills Creek Sedimentation Pond in 2022 were also above their respective reference area normal ranges (Figure 3.4).²² Additionally, consistent with 2019 and 2020, concentrations of PAHs in sediments collected from the Greenhills Creek Sedimentation Pond in 2022 were comparable to or higher than those reported for the creek sampling sites in 2022 (Appendix Table F.20). The samples from the pond had more fine silt and clay and less sand relative to the other sediment sampling locations, which is as expected given the depositional nature of the pond. The predominance of fine sediment particles is expected to contribute to the higher concentrations of cadmium, nickel, selenium, and PAHs observed within the pond sediments (Appendix Tables F.9 and F.20).

In 2022, concentrations of metals in bulk sediment samples from Greenhills Creek Sedimentation Pond were generally lower than or comparable to previous years, whereas concentrations of PAHs were comparable to or higher than in 2019 to 2021 (Figure 3.4; Appendix Table F.22). No inter-annual differences in cadmium, nickel, or selenium concentrations were identified (Appendix Table E.22). Additionally, there was no evidence to suggest cadmium and selenium were distributed differently among sediment fractions 1 to 5 depending on the year (Appendix Table E.23). Conversely, nickel was more closely associated with fractions 1 to 3, with lesser amounts in fraction 5, in 2021 and 2022 relative to 2019 (Appendix Table E.23). For PAHs, the greatest differences among years (i.e., the largest MODs and the largest number of

²² Comparisons of sediment chemistry data to reference area normal ranges were made in consideration of the fact the reference area normal ranges were developed based on data for natural and naturalized lentic areas (i.e., sedimentation ponds were not included in the data set) (Minnow 2020c).



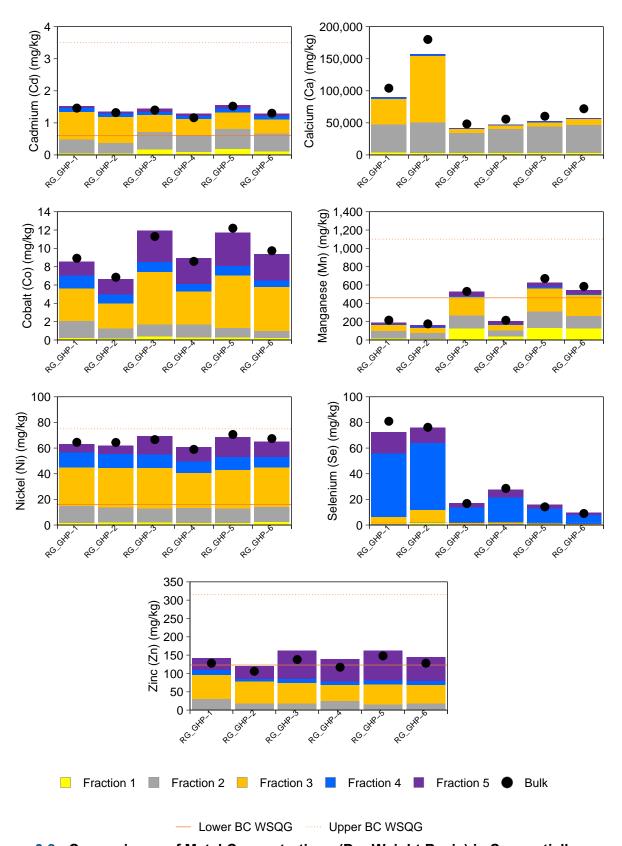


Figure 3.8: Comparisons of Metal Concentrations (Dry Weight Basis) in Sequentially Extracted Sediment Fractions to British Columbia Working Sediment Quality Guidelines, Greenhills Creek Sedimentation Pond (RG_GHP), 2022

Notes: mg/kg = milligrams per kilogram dry weight; BC WSQG = British Columbia Working Sediment Quality Guideline. Values at the Laboratory Reporting Limit (LRL) were plotted at the LRL. Concentrations were determined using Tessier Extraction (Tessier et al. 1979).

affected constituents) were associated with the comparison between 2022 and 2019 (Figure 3.4; Appendix Table E.22).

The SQI for the Greenhills Creek Sedimentation Pond was lower relative to those for the lotic habitats on Gardine and Lower Greenhills creeks (Sections 3.2.2.1 and 3.2.2.2, respectively) in 2022, and was among the lowest reported since 2013 (Appendix Table F.24). These results are attributed to the larger scope, frequency, and amplitude of BC WSQG exceedances within the pond relative to the other GC LAEMP sediment sampling areas, and the higher amplitude of BC WSQG exceedances relative to previous years (Appendix Table F.24).

3.3 Benthic Invertebrate Community

3.3.1 Gardine Creek

Area-based kick samples collected from upper Gardine Creek (RG GAUT) in 2022 had higher percentages of EPT taxa (individually and combined) and lower %Diptera relative to lower Gardine Creek (RG GANF) (Figure 3.9; **Appendix Tables** G.1 G.6). These upstream-to-downstream differences in the percentages of the major taxonomic groups are not unexpected. Lower Gardine Creek is downstream from the seeps from the GHO Coarse Coal Rejects and had poorer water quality (including higher TDS and sulphate concentrations) and substrate (i.e., calcite) conditions relative to upstream in 2022 (see Sections 3.1.1 and 3.2.1.2). In 2022, %EPT was strongly and negatively correlated (rs less than or equal to [≤] -0.6)²³ with concentrations of TDS, sulphate, nickel, and selenium as well as C_c, CI, and Cl' values, whereas %Diptera was strongly and positively correlated (rs greater than or equal to [≥] 0.6) with concentrations of the same constituents and calcite endpoints (Figures 3.10 and 3.11; Tables 3.3 and 3.4). The longer-term data sets for Greenhills and Gardine creeks (i.e., from 2017 to 2022) also supported the conclusion that %Diptera is strongly and positively correlated with sulphate and selenium concentrations, as well as Cc and Cl values (Appendix Figures G.1 and G.2; Appendix Tables G.7 and G.8). Although spatial patterns in benthic invertebrate communities within the Greenhills Creek watershed are thought to be largely attributed to changes in calcite conditions, the potential influence of water quality constituents like TDS and sulphate cannot be ruled out.

No biologically meaningful temporal changes in the benthic invertebrate communities on Gardine Creek were identified, other than lower densities at RG_GAUT (upstream) and higher %Trichoptera at RG_GAUT and RG_GANF (downstream) in 2022 relative to the first year of

²³ Correlations (with water chemistry and calcite) were considered biologically meaningful when the correlation coefficients explained at least 60% of the variance in a given benthic invertebrate community endpoint (i.e., rs \leq -0.6 or rs \geq 0.6 were considered indicative of strong, significant relationships).



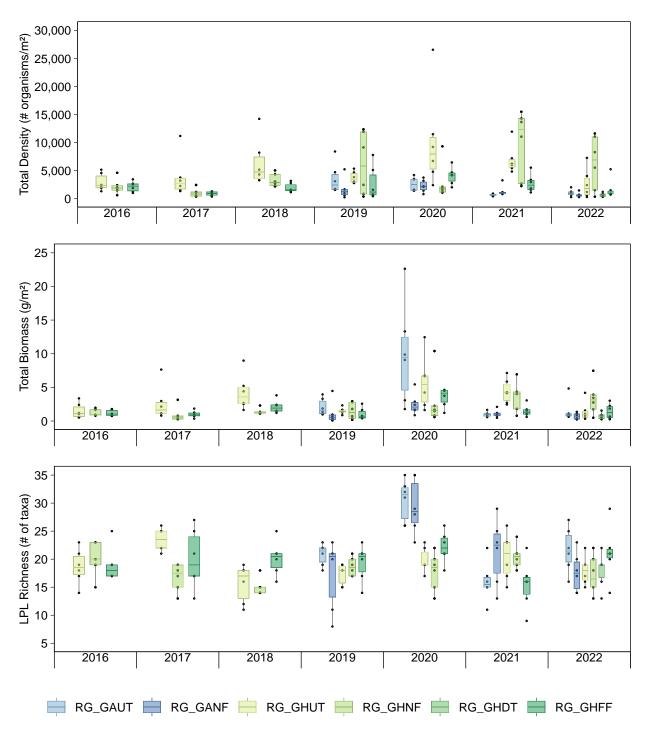


Figure 3.9: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Upper Greenhills and Gardine Creeks, September 2016 to 2022

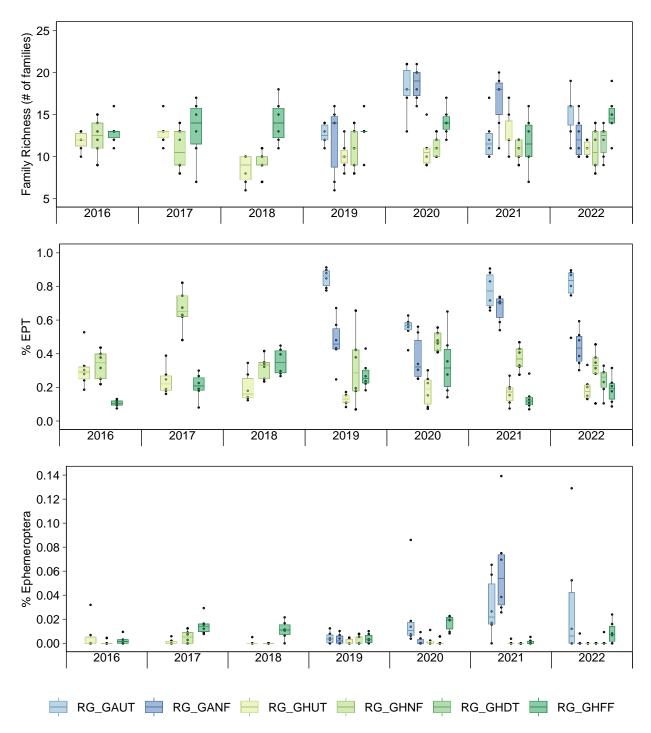


Figure 3.9: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Upper Greenhills and Gardine Creeks, September 2016 to 2022

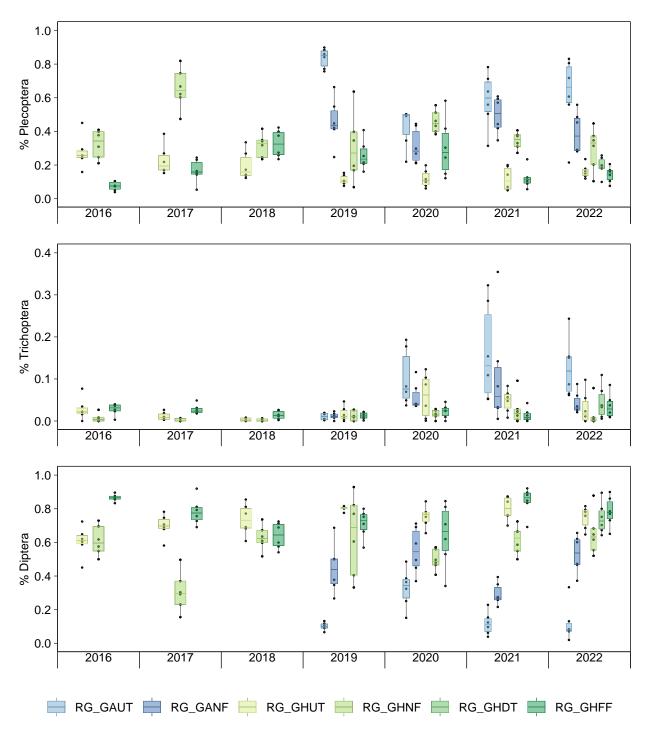


Figure 3.9: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Upper Greenhills and Gardine Creeks, September 2016 to 2022

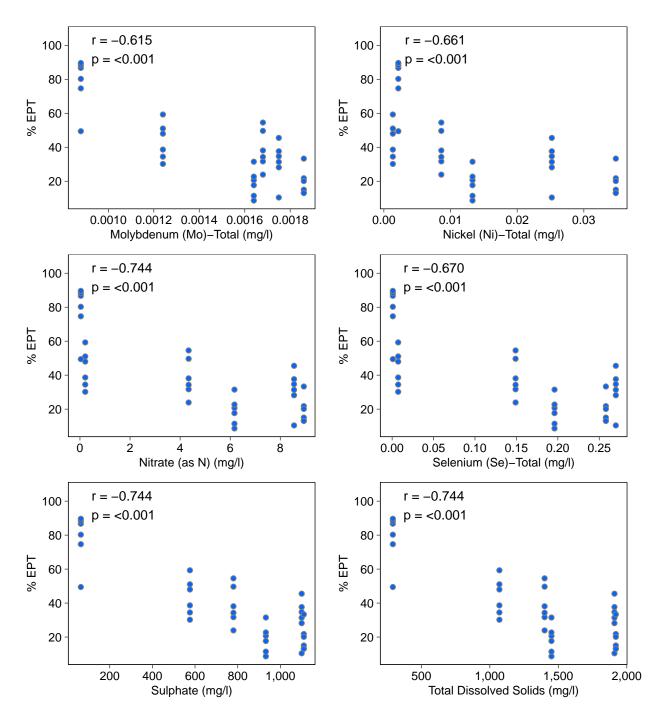


Figure 3.10: Significant Spearman's Correlation Relationships ($r \le -0.6$ or $r \ge 0.6$) Between Benthic Invertebrate Community Endpoints and Water Chemistry Constituents with Early Warning Triggers, Greenhills and Gardine Creeks, 2022

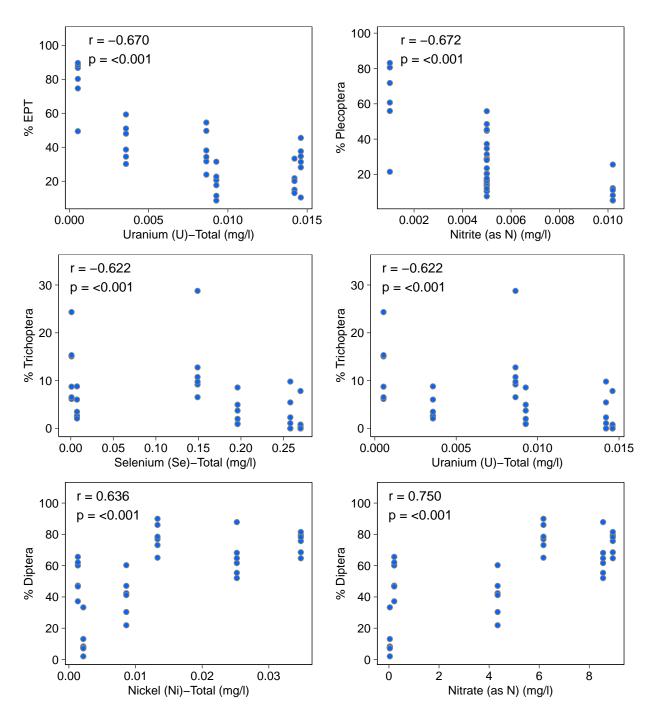


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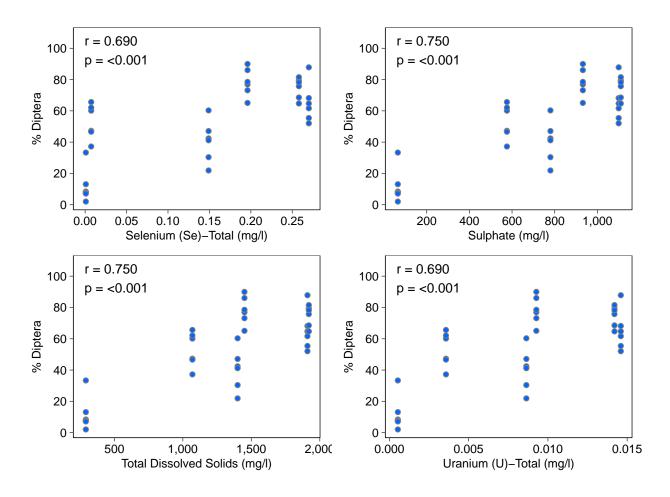


Figure 3.10: Significant Spearman's Correlation Relationships ($r \le -0.6$ or $r \ge 0.6$) Between Benthic Invertebrate Community Endpoints and Water Chemistry Constituents with Early Warning Triggers, Greenhills and Gardine Creeks, 2022

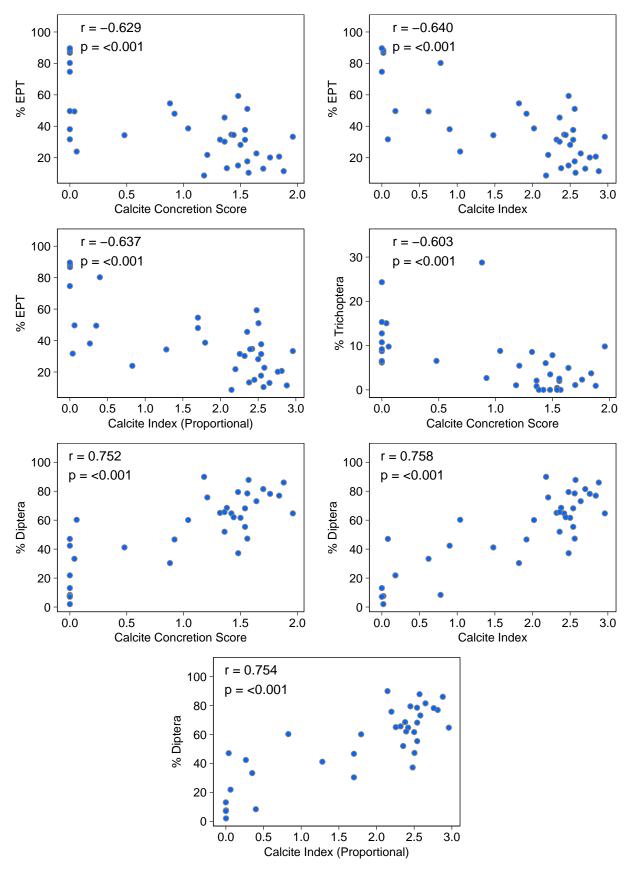


Figure 3.11: Significant Spearman's Correlation Relationships ($r \le -0.6$ or $r \ge 0.6$) Between Benthic Invertebrate Community Endpoints and Calcite Index and Concretion Scores, Greenhills and Gardine Creeks, 2022

Table 3.3: Spearman Rank Correlations Between Benthic Invertebrate Endpoints and Water Quality Constituents with Early Warning Triggers, 2022

Constituent	Density (No. org./m²)		Total Biomass (g/m²)		LPL Richness		Family Richness		%EPT		%Ephemeroptera		%Plecoptera		%Trichoptera		%Diptera	
	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s
Antimony - Total (mg/L)	0.00300	0.481	0.0764	0.299	0.369	-0.154	0.0785	-0.297	<0.001	-0.532	0.446	-0.131	0.00385	-0.470	0.0535	-0.325	0.00523	0.456
Barium - Total (mg/L)	<0.001	-0.565	0.00658	-0.445	0.260	0.193	0.215	0.212	0.0108	0.420	0.865	-0.0294	0.00200	0.498	0.0560	0.321	0.0387	-0.346
Boron - Total (mg/L)	0.0590	-0.318	0.0638	-0.312	0.430	-0.136	0.222	-0.209	0.419	0.139	0.155	-0.242	0.253	0.195	0.465	0.126	0.483	-0.121
Cadmium - Dissolved (mg/L)	0.377	-0.152	0.277	-0.186	0.252	0.196	0.490	0.119	0.472	-0.124	0.808	0.0419	0.561	-0.100	0.215	0.212	0.696	0.0673
Cobalt - Total (mg/L)	0.780	0.0482	0.780	-0.0482	0.541	-0.105	0.0409	-0.342	0.939	-0.0133	0.0113	-0.417	0.159	0.240	0.427	-0.137	0.893	0.0233
Lithium - Total (mg/L)	0.657	-0.0767	0.241	-0.200	0.00693	-0.442	<0.001	-0.574	0.102	-0.277	<0.001	-0.576	0.598	0.0908	<0.001	-0.583	0.00797	0.435
Manganese - Total (mg/L)	0.0491	0.330	0.241	0.200	0.467	-0.125	0.0516	-0.327	0.264	-0.191	0.102	-0.277	0.772	-0.0501	0.226	-0.207	0.402	0.144
Molybdenum - Total (mg/L)	0.00773	0.437	0.162	0.238	0.131	-0.257	0.0182	-0.392	<0.001	-0.615	0.237	-0.202	0.00125	-0.517	0.00894	-0.430	<0.001	0.570
Nickel - Total (mg/L)	0.0141	0.406	0.289	0.182	0.377	-0.152	0.0360	-0.351	<0.001	-0.661	0.124	-0.261	0.00797	-0.435	0.00407	-0.467	<0.001	0.636
Nitrate as N (mg/L)	0.0302	0.362	0.484	0.121	0.135	-0.254	0.00652	-0.445	<0.001	-0.744	0.0477	-0.332	0.00290	-0.482	<0.001	-0.572	<0.001	0.750
Nitrite as N (mg/L)	0.0469	0.333	0.0574	0.320	0.787	-0.0465	0.473	0.124	0.0614	-0.315	0.0134	0.408	<0.001	-0.672	0.830	0.0371	0.256	0.195
Selenium - Total (mg/L)	0.00823	0.434	0.223	0.208	0.110	-0.271	0.00631	-0.447	<0.001	-0.670	0.0477	-0.332	0.0137	-0.407	<0.001	-0.622	<0.001	0.690
Sulfate (mg/L)	0.0302	0.362	0.484	0.121	0.135	-0.254	0.00652	-0.445	<0.001	-0.744	0.0477	-0.332	0.00290	-0.482	<0.001	-0.572	<0.001	0.750
Total Dissolved Solids (mg/L)	0.0302	0.362	0.484	0.121	0.135	-0.254	0.00652	-0.445	<0.001	-0.744	0.0477	-0.332	0.00290	-0.482	<0.001	-0.572	<0.001	0.750
Uranium - Total (mg/L)	0.00823	0.434	0.223	0.208	0.110	-0.271	0.00631	-0.447	<0.001	-0.670	0.0477	-0.332	0.0137	-0.407	<0.001	-0.622	<0.001	0.690
Zinc - Total (mg/L)	0.0136	0.408	0.0795	0.296	0.365	-0.156	0.221	-0.209	0.0349	-0.353	0.895	0.0227	0.00277	-0.484	0.575	-0.0966	0.172	0.233

P-value <0.05/n parameters = 0.05/16 = 0.00313. $r_s \le -0.6$ or $r_s \ge 0.6$.

Notes: No. org./m² = number of organisms per square metre; g/m² = grams per square metre; LPL = Lowest Practical Level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera combined; rs = Spearman's correlation coefficient; mg/L = milligrams per litre; < = less than; < = less than or equal to; \geq = greater than or equal to.

Table 3.4: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Calcite, Greenhills and Gardine Creeks, 2022

Endpoint	Calcite I	ndex (CI)	Proportion Index	nal Calcite ‹ (CI')	Concretion Score		
	r _s	P-value	r _s	P-value	r _s	P-value	
Density (No. organisms/m²)	0.0582	0.736	0.0763	0.658	0.0302	0.861	
Total Biomass (g/m²)	-0.120	0.485	-0.108	0.530	-0.134	0.436	
LPL Richness	-0.190	0.267	-0.183	0.285	-0.198	0.247	
Family Richness	-0.399	0.0159	-0.407	0.0137	-0.406	0.0139	
%EPT	-0.640	<0.001	-0.637	<0.001	-0.629	<0.001	
%Ephemeroptera	-0.463	0.00448	-0.473	0.00360	-0.473	0.00360	
%Plecoptera	-0.270	0.111	-0.260	0.126	-0.237	0.164	
%Trichoptera	-0.587	<0.001	-0.597	<0.001	-0.603	<0.001	
%Diptera	0.758	<0.001	0.754	<0.001	0.752	<0.001	

P-value <0.017 (0.05/3 for Bonferroni correction). $r_s \le -0.6$ or $r_s \ge 0.6$.

Notes: rs = Spearman's correlation coefficient; No. organisms/m 2 = number of organisms per square metre; g/m 2 = grams per square metre; LPL = Lowest Practical Level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera combined; < = less than; \leq = less than or equal to; \geq = greater than or equal to.

monitoring in 2019 (Appendix Figures G.3 and G.4; Appendix Table G.9). However, despite being lower relative to 2019, total invertebrate densities at RG_GAUT in 2022 were statistically similar to 2021 (Appendix Figure G.3).

3.3.2 Upper and Lower Greenhills Creek

3.3.2.1 Area-Based Kicks

Benthic invertebrate densities and LPL richness were similar among biological monitoring areas on Upper and Lower Greenhills Creek in 2022, whereas spatial patterns were identified for the remaining endpoints that were evaluated (Figures 3.8 Appendix Tables G.1, G.2, and G.10 to G.17). First, biomass and %EPT were higher at RG GHBP on Lower Greenhills Creek relative to upstream areas RG GHUT and RG GHFF. Second, %Ephemeroptera and %Trichoptera were higher and %Diptera were lower in Lower versus Upper Greenhills Creek in 2022 (Figures 3.8 and 3.12; Appendix Table G.18). Finally, family richness was higher in Greenhills Creek downstream from the Gardine Creek mouth (RG GHFF and RG GHBP) than it was upstream (RG GHUT and RG GHNF; Appendix Table G.18). Overall, in light of fairly similar benthic invertebrate densities among areas, the higher benthic invertebrate biomass at RG GHBP on Lower Greenhills Creek suggests that the availability of food for fish was potentially better in Lower Greenhills Creek relative to upstream in 2022. Additionally, benthic invertebrate communities in Upper Greenhills Creek appear to show more signs of mine-related influence, given the higher %Diptera and lower %EPT and %Ephemeroptera relative to Lower Greenhills Creek.

Few consistent temporal patterns in benthic invertebrate community endpoints were identified for the biological monitoring areas on Greenhills Creek (Figures 3.8 and 3.12; Appendix Table G.18). However, %Diptera at RG_GHUT, which is the furthest upstream station on Greenhills Creek, increased gradually over time since 2016 and then levelled off after 2019 (Figure 3.8; Appendix Table G.18). The apparent increase may be attributed to C_c scores at RG_GHUT generally being higher after 2018, especially considering that concentrations of some mine-related constituents (e.g., TDS and sulphate) have not increased over time within that area (Section 3.2.1.2; Appendix Tables E.4 and F.8). Invertebrate densities were lower at RG_GHBP on Lower Greenhills Creek in 2022 relative to the base year of monitoring (i.e., 2016) but were similar to 2017 to 2021 (Figure 3.12; Appendix Table G.18). Percentages of Ephemeroptera were also higher at RG_GHBP in 2022 relative to 2016, but were similar to 2017 to 2022 (Figure 3.12; Appendix Table G.18).

Comparisons of benthic invertebrate community endpoints between Upper (untreated) and Lower (treated) Greenhills Creek before (i.e., 2016 and 2017) and after (2018 to 2022) initiation of

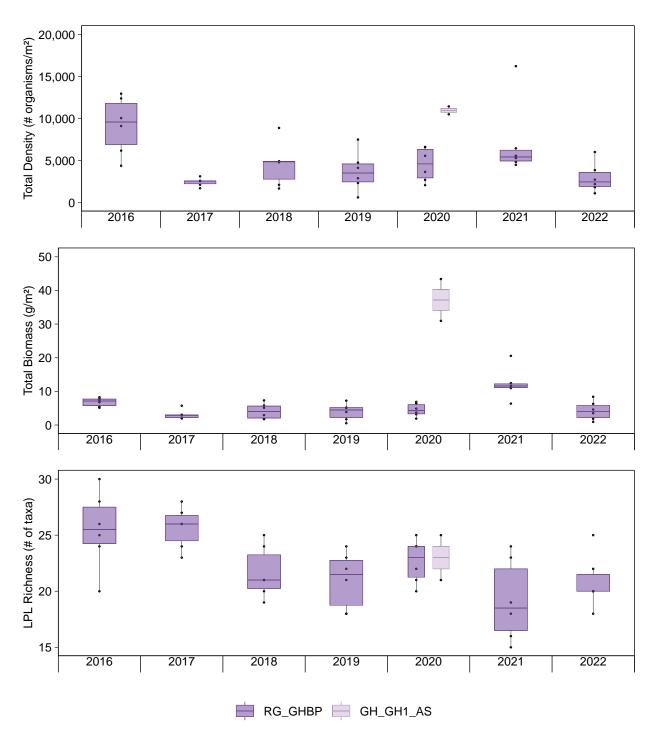


Figure 3.12: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Lower Greenhills Creek, September 2018 to 2022

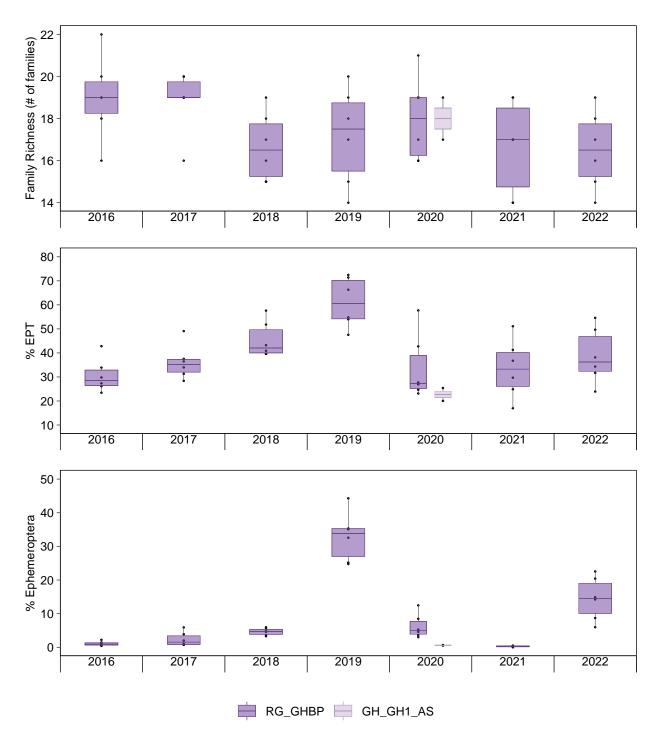


Figure 3.12: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Lower Greenhills Creek, September 2018 to 2022

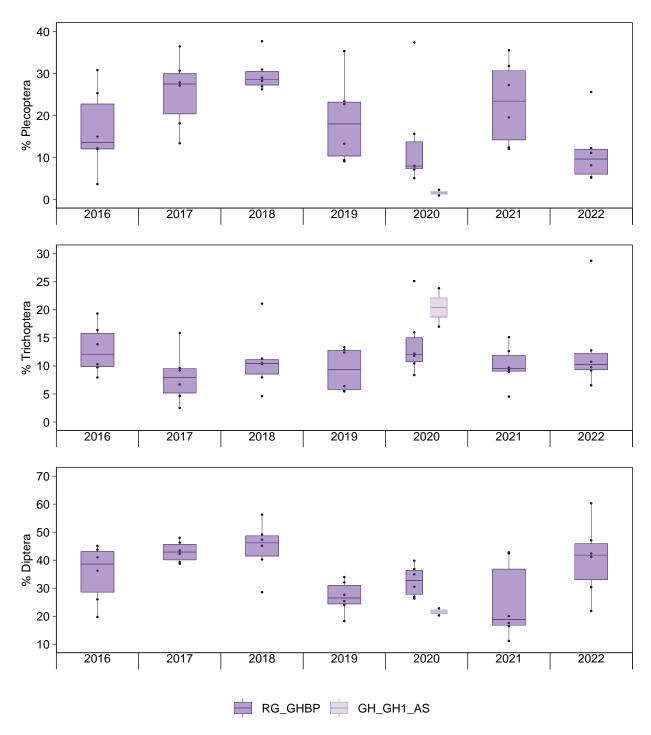


Figure 3.12: Benthic Invertebrate Community Endpoints for Area-based Kick Samples, Lower Greenhills Creek, September 2018 to 2022

antiscalant addition showed that, overall, density, biomass, LPL richness, family richness, %EPT, %Trichoptera, %Plecoptera, and %Diptera have not changed significantly in Lower Greenhills Creek, relative to Upper Greenhills Creek, since the initiation of treatment (Figure 3.13 Appendix Tables G.19 and G.20). However, there were a small number of differences among specific areas and years for endpoints other than %Trichoptera (Appendix Tables G.19 and G.20).

Large overall differences in %Ephemeroptera between RG_GHBP (treated) and all areas in Upper Greenhills Creek (untreated) were identified for 2018, 2019, 2020, and 2022 relative to 2016 and in 2019, 2020, and 2022 relative to 2017, due to higher %Ephemeroptera in Lower Greenhills Creek (Figure 3.13; Appendix Table G.21). Increases in %Ephemeroptera, which are less tolerant of degraded conditions, within Lower Greenhills Creek following initiation of antiscalant addition are considered indicative of improvements in calcite conditions downstream from the AAS (i.e., prevention of further calcite deposition and lower C_c scores in 2020 to 2022 relative to pre-treatment; see Section 3.2.1.2). These results are supported by the spatial and temporal comparisons described above, as well as consideration of correlations between benthic invertebrate community endpoints and concentrations of water quality constituents (e.g., TDS and sulphate, which did not exhibit upstream-to-downstream patterns in Greenhills Creek) and/or calcite endpoints (Figures 3.10 and 3.11; Tables 3.3 and 3.4; Appendix Table G.18). Therefore, observed differences or changes in benthic invertebrate communities are generally as expected.

3.3.2.2 Timed Kicks

For the timed kick samples, qualitative comparisons of benthic invertebrate community endpoints among areas and to reference area normal ranges highlighted similarities among RG GHNF and RG GHDT on Upper Greenhills Creek and RG GHCKD on Lower Greenhills Creek (Appendix Figures G.5 and G.6; Appendix Tables G.22 to G.26). Total benthic invertebrate abundances at all three areas were generally at the lower boundary of or below the regional reference area normal range in 2022 (Appendix Figures G.5 and G.6). Except for one sample from RG GHNF with a dipteran abundance of over 9,000 organisms per three-minute kick, abundances of the of major taxonomic groups (individually and combined) at RG GHNF and RG GHDT marginally within reference were or below area normal ranges (Appendix Figures G.5 and G.6; Appendix Table G.22). Finally, %EPT and %Ephemeroptera were below regional reference area normal ranges throughout Greenhills Creek in 2022 (Appendix Figures G.5 and G.6). Ephemeroptera made up larger percentages of the samples from RG GHCKD relative to RG GHNF and RG GHDT, whereas %Diptera was lower for the RG GHCKD samples (Appendix Table G.22). Family richness appeared to be higher at

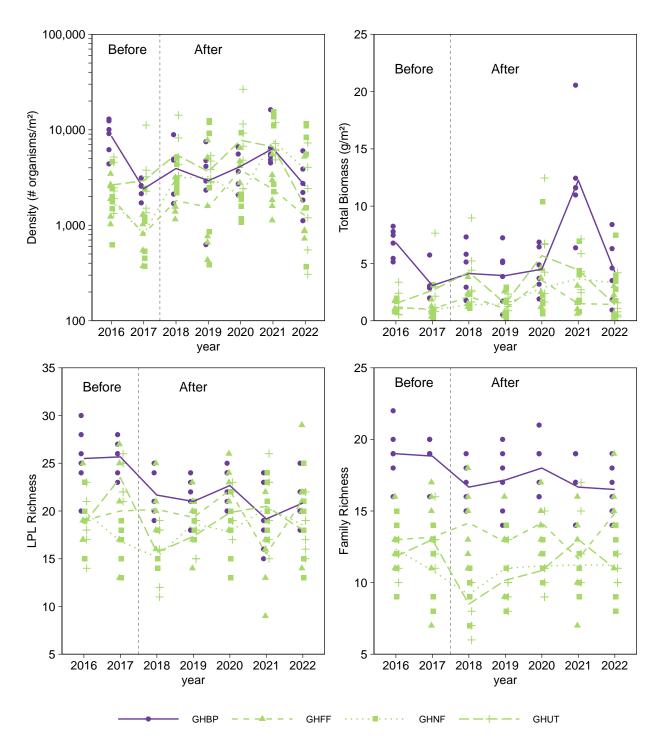


Figure 3.13: Benthic Invertebrate Endpoint Comparisons Before and After the Initiation of Antiscalant Treatment on Lower Greenhills Creek, 2016 to 2022

Notes: Purple represents the area on Lower Greenhills Creek that received treatment from 2017 to 2022. Green represents the areas on Upper Greenhills Creek that did not receive treatment from 2017 to 2022. Dashed or solid lines connect annual means for each area. When there was no Before–After–Control–Impact (BACI) area interaction in the Analysis of Variance (ANOVA) model (interaction p–value > 0.1), an annual mean for all untreated areas was calculated and displayed with a solid green line.

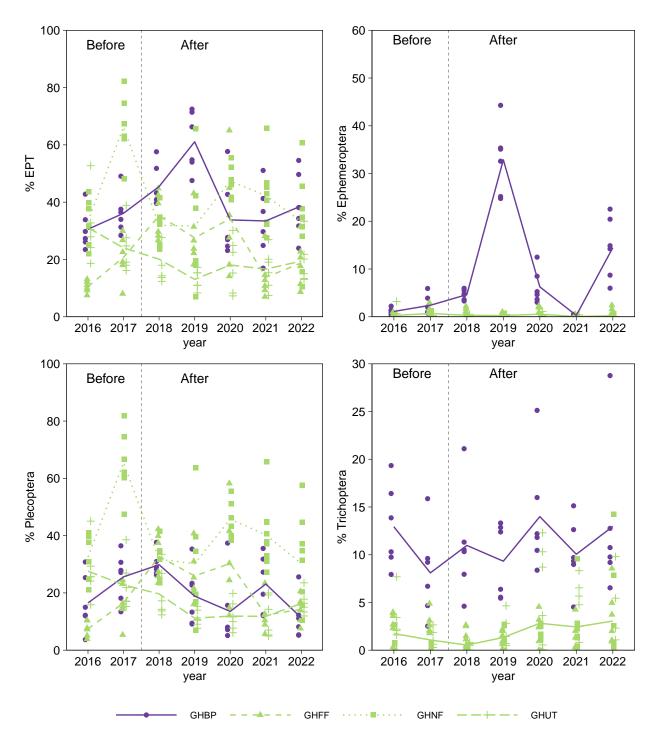


Figure 3.13: Benthic Invertebrate Endpoint Comparisons Before and After the Initiation of Antiscalant Treatment on Lower Greenhills Creek, 2016 to 2022

Notes: Purple represents the area on Lower Greenhills Creek that received treatment from 2017 to 2022. Green represents the areas on Upper Greenhills Creek that did not receive treatment from 2017 to 2022. Dashed or solid lines connect annual means for each area. When there was no Before–After–Control–Impact (BACI) area interaction in the Analysis of Variance (ANOVA) model (interaction p–value > 0.1), an annual mean for all untreated areas was calculated and displayed with a solid green line.

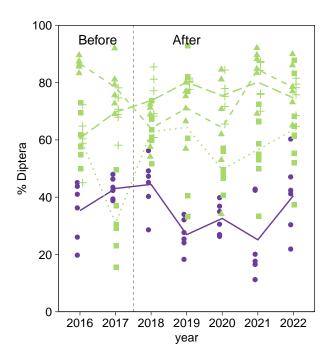




Figure 3.13: Benthic Invertebrate Endpoint Comparisons Before and After the Initiation of Antiscalant Treatment on Lower Greenhills Creek, 2016 to 2022

Notes: Purple represents the area on Lower Greenhills Creek that received treatment from 2017 to 2022. Green represents the areas on Upper Greenhills Creek that did not receive treatment from 2017 to 2022. Dashed or solid lines connect annual means for each area. When there was no Before–After–Control–Impact (BACI) area interaction in the Analysis of Variance (ANOVA) model (interaction p–value > 0.1), an annual mean for all untreated areas was calculated and displayed with a solid green line.

RG_GHCKD relative to RG_GHNF, despite LPL richness being similar between the two areas (Appendix Figures G.5 and G.6; Appendix Table G.22).

Total benthic invertebrate abundances were the lowest reported for timed kick samples collected from Lower Greenhills Creek (RG_GHCKD) in 2022 compared to previous years (Appendix Figure G.6). However, %Ephemeroptera was higher in Lower Greenhills Creek in 2022 relative to all years sampled except 2019, which is consistent with the results for the area-based samples (Figure 3.12).

3.3.3 Greenhills Creek Sedimentation Pond

Data collected in 2022 represent the fifth year of pre-treatment benthic invertebrate community data and associated field measurements for the Greenhills Creek Sedimentation Pond (Appendix Tables G.27 to G.32). Results for each endpoint were generally comparable from 2018 to 2022, except for density and total biomass which were lower in 2022 compared to previous years (Figure 3.14). Similar to previous years, %Diptera was much higher than %EPT, which is not unexpected for a pond environment, and EPT taxa were dominated by Ephemeroptera (Figure 3.14; Appendix Table G.28). Bivalves were the predominant taxonomic group in each of the n = 6 samples from Greenhills Creek Sedimentation Pond (i.e., 12 to 72% of organisms), followed by Diptera (i.e., 15 to 59% of organisms; Appendix Table G.28).

3.3.4 Biological Triggers

Percentages of EPT in the timed kick samples collected from RG_GHNF and RG_GHCKD on Greenhills Creek were compared to biological triggers for this endpoint (information pertaining to the determination of the biological trigger values can be found in Appendix H). Comparisons to biological triggers were completed based on available water quality predictions for monthly water quality monitoring stations GH_HWGH_BRB (paired with RG_GHNF) and GH_GH1 (paired with RG_GHCKD). In 2022, %EPT values in two of three samples from RG_GHNF and each of the three samples collected from RG_GHCKD exceeded the biological triggers based on the predicted Aquatic Data Integration Tool (ADIT) scores for each location (Appendix Figure H.1; Appendix Table H.1).

3.4 Benthic Invertebrate Tissue Chemistry

3.4.1 Gardine Creek

Selenium concentrations in composite taxa benthic invertebrate samples collected from lower Gardine Creek (RG_GANF) were significantly lower (MOD = 57%) relative to upper Gardine Creek (RG GAUT) in September 2022 (Figure 3.15; Appendix Tables I.1 and I.2).

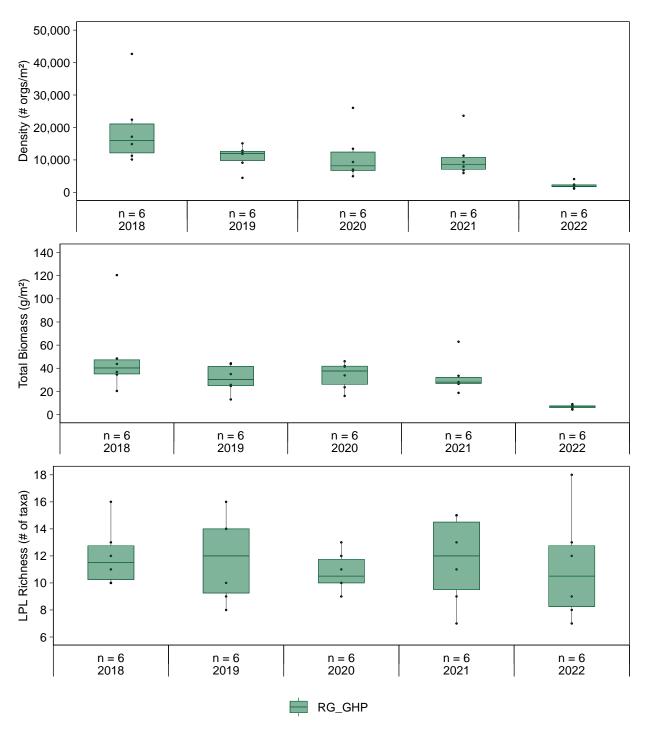


Figure 3.14: Benthic Invertebrate Community Endpoints for Greenhills Creek Sedimentation Pond, September 2018 to 2022

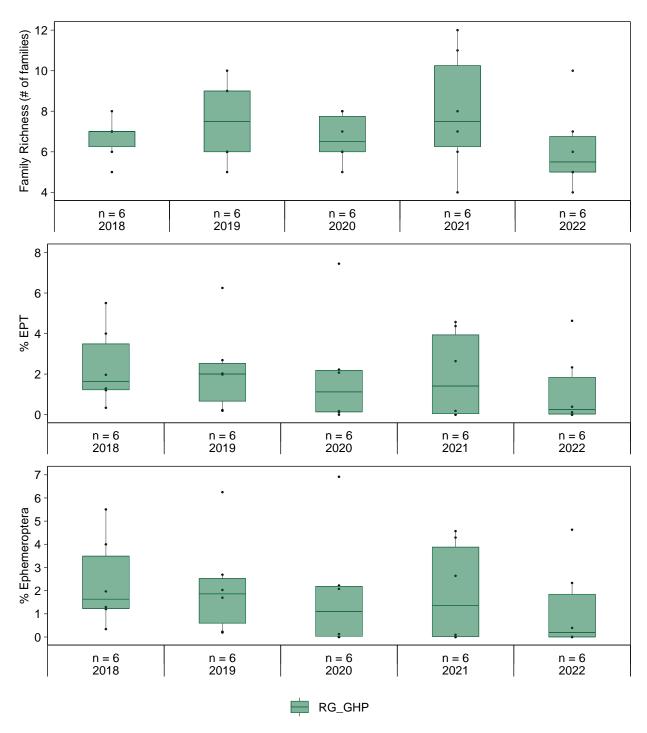


Figure 3.14: Benthic Invertebrate Community Endpoints for Greenhills Creek Sedimentation Pond, September 2018 to 2022

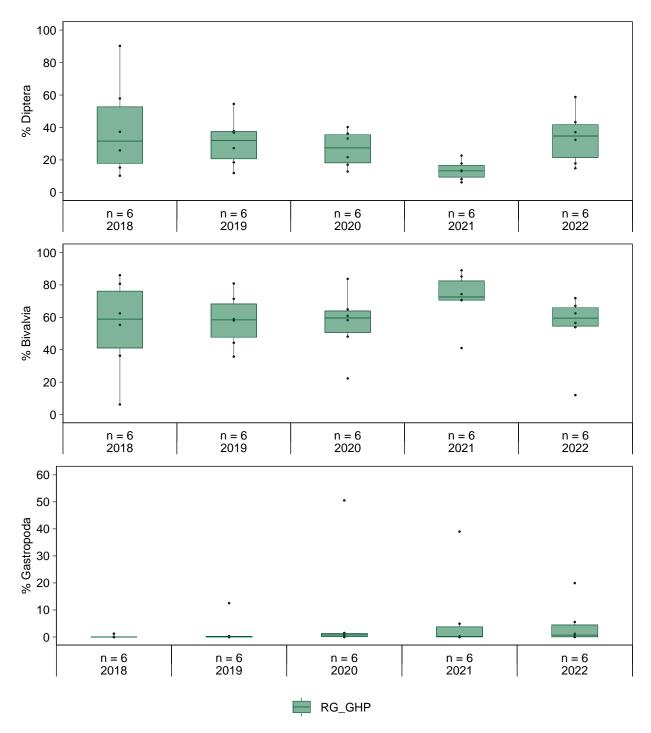


Figure 3.14: Benthic Invertebrate Community Endpoints for Greenhills Creek Sedimentation Pond, September 2018 to 2022

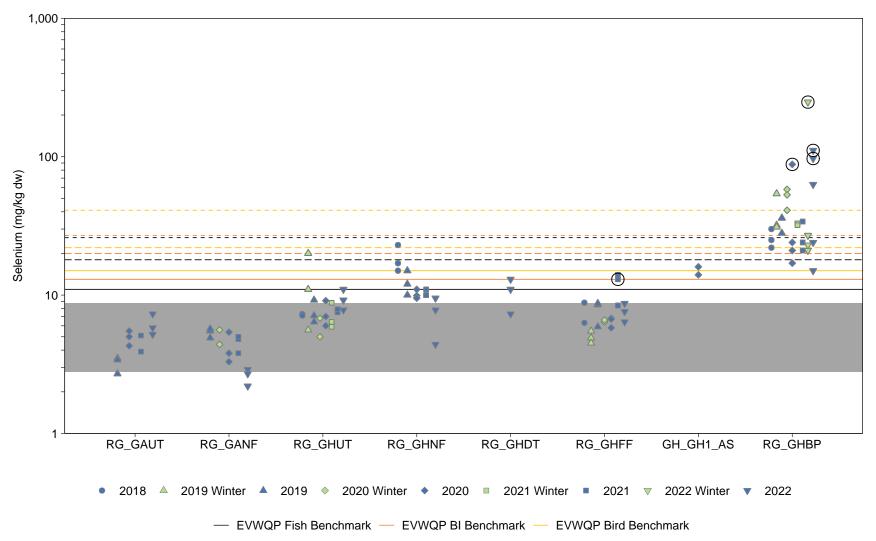


Figure 3.15: Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples from Greenhills and Gardine Creeks, 2018 to 2022

Notes: Grey shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) from the Regional Aquatic Effects Monitoring Program (RAEMP). Solid line = Level 1 Benchmark, long hashed line = Level 2 Benchmark, short hashed line = Level 3 Benchmark. Annelid-only samples are included in the plot and are circled in black to differentiate them from the composite-taxa samples.

Previously (i.e., from 2019 to 2021), selenium concentrations in samples from RG_GAUT and RG_GANF were similar (Appendix Table I.2). Additionally, selenium concentrations in tissue samples from Gardine Creek were consistently within or below the reference area normal range and below EVWQP Benchmarks (Figure 3.15; Appendix Table I.1).

Selenium concentrations in composite-taxa benthic invertebrate tissue chemistry samples from Gardine Creek were not consistently aligned with expected based on water quality. Selenium concentrations in samples from RG_GAUT (upper Gardine Creek) were consistently with prediction interval limits based on the selenium bioaccumulation model and close to mean predicted concentrations generated using the B-tool (Figure 3.16; Appendix Tables I.4 and I.5). Selenium concentrations in samples from RG_GANF (lower Gardine Creek) were below the prediction interval limits associated with the selenium bioaccumulation model but close to mean predictions based on the B-tool (Figure 3.16; Appendix Tables I.4 and I.5).

3.4.2 Upper and Lower Greenhills Creek

Few spatial and temporal patterns in benthic invertebrate tissue selenium concentrations were identified for Greenhills Creek (Figure 3.17; Appendix Figure I.1; Appendix Tables I.2, I.3, and I.6). Selenium concentrations in composite-taxa benthic invertebrate tissue samples collected from Upper Greenhills Creek in September 2022 were comparable among stations (i.e., RG_GHUT, RG_GHNF, RG_GHDT, and RG_GHFF), but lower relative to Lower Greenhills Creek, which is downstream from the Greenhills Creek Sedimentation Pond (Figures 3.15 and 3.17; Appendix Tables I.1 and I.2). Concentrations in tissue samples from RG_GHNF on Upper Greenhills Creek decreased in 2021 (MOD = 43%) and 2022 (MOD = 68%) relative to 2018 (Figure 3.17; Appendix Table I.3).

Selenium concentrations in composite-taxa benthic invertebrate tissue samples from Upper Greenhills Creek were occasionally (i.e., in zero to two of the n = 3 samples per area) above the upper boundary of the reference area normal range and were only rarely (i.e., one sample from RG GHDT) above EVWQP Level 1 Benchmarks (Figure 3.15; Appendix Table I.1).

Unlike Upper Greenhills and Gardine creeks, selenium concentrations in annelid-free composite-taxa samples collected from Lower Greenhills Creek (RG_GHBP) in 2022 were consistently above the reference area normal range and the EVWQP Level 2 Benchmark for growth, reproduction, and survival of benthic invertebrates (i.e., 20 milligrams per kilogram dry weight [mg/kg dw]) (Figure 3.15; Appendix Table I.1). One of the composite-taxa samples from February 2022 also had a selenium concentration (27 mg/kg dw) greater than the EVWQP Level 3 Benchmark for dietary effects to juvenile fish (i.e., 26 mg/kg dw). All but one of the five annelid-containing (composite and single -taxon) samples collected from Lower Greenhills Creek

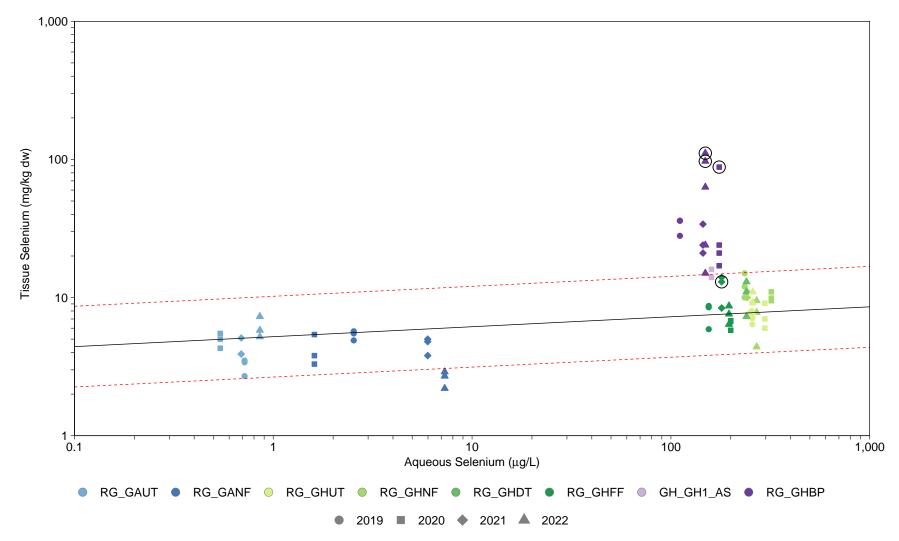


Figure 3.16: Selenium Concentrations in Benthic Invertebrate Tissues Relative to Predictions and Aqueous Selenium Concentrations, September 2018 to 2022

Notes: Mean benthic invertebrate selenium concentrations (solid black line) were estimated using a one–step water to benthic invertebrate selenium accumulation model: $log_{10}[Se]_{benthic invertebrate} = 0.720 + 0.071 \times log_{10}[Se]_{aqueous}$ (Golder 2020). The 95% prediction limits for a single value from the one –step water to benthic invertebrate selenium bioaccumulation model are plotted as dashed red lines. The annelid–containing samples are circled in black to differentiate them from the other samples.

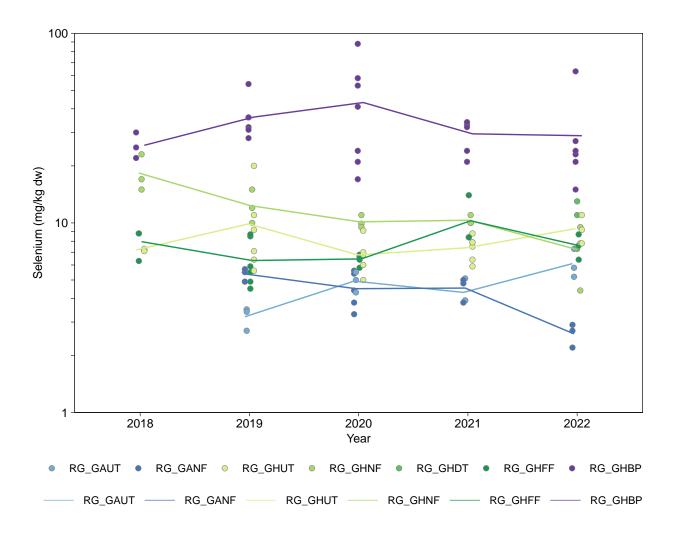


Figure 3.17: Comparisons of Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples from Greenhills and Gardine Creeks, September 2018 to 2022

Notes: Solid lines connect annual means for each area. Biological monitoring area RG_GHDT was sampled for the first time in 2022.

in 2022 had selenium concentrations greater than the reference area normal range and EVWQP Level 3 Benchmarks in 2022 (Figure 3.15; Appendix Table I.1).

Selenium concentrations in composite-taxa benthic invertebrate tissue samples from Greenhills Creek were generally aligned with expectations based on water quality and conditions of organoselenium speciation. Specifically, selenium concentrations in samples from Upper Greenhills Creek were within prediction intervals generated using the selenium bioaccumulation model and close to mean B-tool predictions (Figure 3.16; Appendix Tables I.4 and I.5). In Lower Greenhills Creek, eight of the n = 9 benthic invertebrate tissue chemistry samples (composite-taxa, composite-taxa with annelids, and annelid-only) collected in 2022 had selenium concentrations that were above prediction limits based on the selenium bioaccumulation model and were closer to mean predicted values from the B-tool (Figures 3.16 and 3.18; Appendix Tables I.4 and I.5). The B-tool analysis results are as expected, given that Greenhills Creek Sedimentation Pond is a known source of organoselenium to the downstream environment in Lower Greenhills Creek.

Selenium concentrations in annelid-free, composite-taxa benthic invertebrate tissue samples from Lower Greenhills Creek (RG GHBP) were within a factor of two of predicted mean values based on the B-tool, which is the criterion used by de Bruyn and Luoma (2021) to indicate reasonable alignment (Appendix Table I.5). It is considered likely that speciation is a contributing factor to the higher selenium concentrations observed in benthic invertebrate tissues. Lower Greenhills Creek is downstream from the Greenhills Creek Sedimentation Pond, which possesses characteristics of natural or naturalized lentic habitats that may be more conducive to enhanced formation of organoselenium species (ADEPT 2022; Golder 2021; Orr et al. 2006). The effects of the pond on selenium speciation are expected to carry over to Lower Greenhills Creek. In Lower Greenhills Creek, combined concentrations of dimethylselenoxide and methylseleninic acid in water were consistently greater than the draft screening value (0.025 µg/L) for detectable increases in selenium bioaccumulation in 2022 (Appendix Table E.3; ADEPT 2022). Aqueous concentrations of these two organoselenium species were notably higher in the pond and Lower Greenhills Creek relative to upstream biological monitoring areas and downstream sampling locations on the UFR in 2022 (Figure 3.19; Appendix Table E.3; see also the longitudinal study results in ADEPT et al. 2023).

3.4.3 Greenhills Creek Sedimentation Pond

Similar to 2021 (Minnow 2022a), selenium concentrations in the composite-taxa benthic invertebrate tissue chemistry sub-samples from Greenhills Creek Sedimentation Pond were higher than concentrations in the bivalve-only samples/sub-samples (Figure 3.20; Appendix Table I.7). Selenium concentrations in the bivalve-only samples were within the

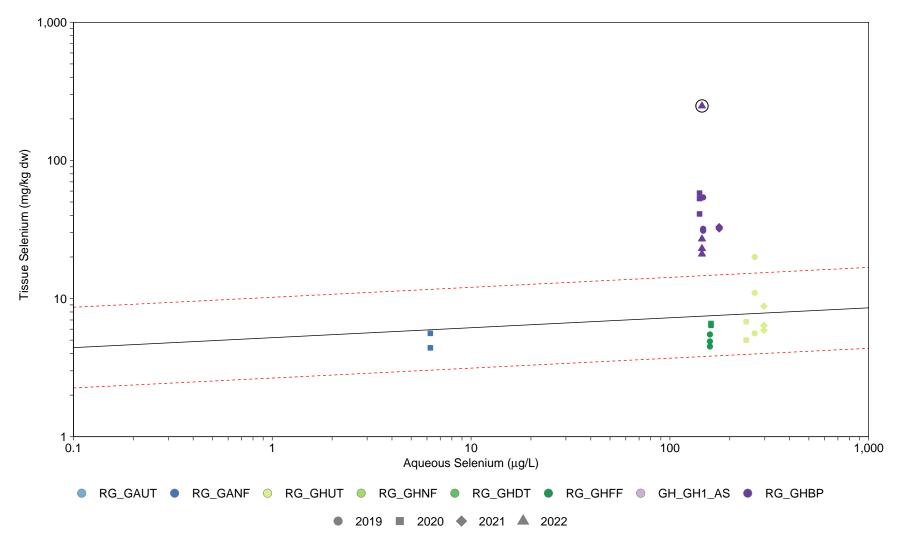


Figure 3.18: Selenium Concentrations in Benthic Invertebrate Tissues Relative to Predictions and Aqueous Selenium Concentrations, February 2018 to 2022

Notes: Mean benthic invertebrate selenium concentrations (solid black line) were estimated using a one–step water to benthic invertebrate selenium accumulation model: $log_{10}[Se]_{benthic invertebrate} = 0.720 + 0.071 \times log_{10}[Se]_{aqueous}$ (Golder 2020). The 95% prediction limits for a single value from the one–step water to benthic invertebrate selenium bioaccumulation model are plotted as dashed red lines. The annelid–containing samples are circled in black to differentiate them from the other samples.

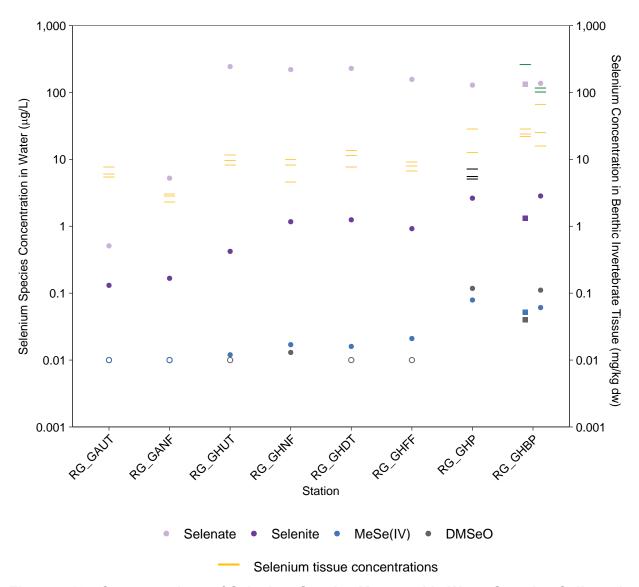


Figure 3.19: Concentrations of Selenium Species Measured in Water Samples Collected Concurrent with Benthic Invertebrate Tissue Samples, February (Squares) and September (Circles) 2022

Notes: Only species with detected values are shown and samples at the laboratory reporting limit (LRL) are plotted with an open symbol at the LRL. All tissue concentrations are for composite samples (orange), except n = 3 annelid-only samples (green) and n = 3 bivalve-only samples (black).

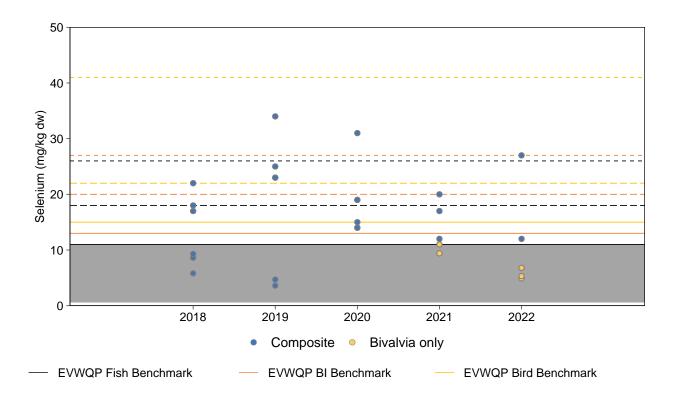


Figure 3.20: Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissues from Greenhills Creek Sedimentation Pond, 2018 to 2022

Notes: Grey shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) from the Regional Aquatic Effects Monitoring Program (RAEMP). Solid line = Level 1 Benchmark, long hashed line = Level 2 Benchmark, short hashed line = Level 3 Benchmark. All samples were collected in September.

reference area normal range and less than EVWQP Benchmarks. Conversely, concentrations in the composite-taxa samples from RG_GHP-3 and RG_GHP-5 were above the reference area normal range and Level 1 and Level 3 Benchmarks, respectively (Figure 3.20; Appendix Table I.7).

Because selenium exposure of WCT occurs via dietary pathways, selenium concentrations in benthic invertebrate tissues are a useful proxy for understanding selenium exposure in WCT, and changes in concentrations over time within benthic invertebrate tissues are expected to provide an indication of changes in the level of potential risk to WCT. Concurrent benthic invertebrate and WCT tissue chemistry sampling within the Greenhills Creek Sedimentation Pond was last completed in 2018 (Minnow 2019). Ultimately, data for the community samples collected in 2018 and 2022 suggest the dominant taxa (i.e., bivalves and chironomids) were sufficiently similar in 2018 and 2022 to allow qualitative comparisons among years (Appendix Table G.32). Results of these comparisons suggest that potential selenium-related risks to WCT feeding on benthic invertebrates originating from within the Greenhills Creek Sedimentation Pond were likely similar to 2018 (Figure 3.20).

As indicated in Section 3.4.2, selenium concentrations in the benthic invertebrate tissues collected from the pond (RG_GHP) may have resulted, at least in part, from the presence of more bioavailable forms of aqueous selenium. Consistent with 2021 (Minnow 2022a), concentrations of dimethylselenoxide and methylseleninic acid in water were higher in the Greenhills Creek Sediment Pond than all other upstream monitoring areas (Figure 3.19). Observed selenium concentrations in tissues were below B-tool predictions, which are based on aqueous selenium speciation and sulphate data (Appendix Table I.5).

3.4.4 Biological Triggers

Selenium concentrations in benthic invertebrate tissues were also assessed relative to the biological triggers established for this endpoint (information pertaining to the evaluation of the biological triggers can be found in Appendix H). This was completed for each composite-taxa (excluding samples that contained annelids) benthic invertebrate community sample collected from biological monitoring areas RG GHNF (Upper Greenhills Creek) and RG GHCKD and RG GHBP (Lower Greenhills Creek). Water quality predictions for monthly water quality monitoring stations GH HWGH BRB (Upper Greenhills Creek) and GH GH1 (Lower Greenhills Creek) were also used. None of the samples collected from RG GHNF on Upper Greenhills Creek in September 2022 (n = 3) exceeded the biological trigger for benthic invertebrate tissue selenium concentrations (Appendix Figure H.2; Appendix Table H.2). However, all of the annelid-free composite-taxa samples from Lower Greenhills Creek (n = 3 at RG GHBP in February 2022 and n = 1 each at RG GHBP and RG GHCKD in September 2022) exceeded the biological trigger) (Appendix Figure H.2; Appendix Table H.2). The biological trigger exceedances for these monitoring locations are likely related to a combination of the factors discussed in the preceding sections, including proximity to the Greenhills Creek Sedimentation Pond discharge, which could influence selenium speciation.

3.5 Westslope Cutthroat Trout

Westslope cutthroat trout are the only fish species found in the Greenhills Creek watershed. There is a single, isolated population that can access and use habitats within Upper Greenhills and Gardine creeks and can move downstream into the Greenhills Creek Sedimentation Pond. A partial barrier at the conveyor culvert upstream from the Greenhills Creek Sedimentation Pond was identified in 2022, and acts as a potential barrier to upstream fish movement into Upper Greenhills and Gardine creeks (i.e., for some life stages under some flow conditions). Downstream from the Stilling Basin at the Greenhills Creek Sedimentation Pond outlet, there is a culvert with a duckbill outlet that is designed to prevent upstream movement of WCT from Lower Greenhills Creek. The WCT in Lower Greenhills Creek can access the UFR and are considered part of the UFR WCT population (Appendix C).

Redds, which can have more than a single nest, were observed in Upper and Lower Greenhills and Gardine creeks in 2022. The estimated number of unique nests in Lower Greenhills Creek was eight in 2022 and 20 in 2021. There were insufficient data to estimate the number of unique nests in Upper Greenhills or Gardine creeks in 2022. Comparisons to earlier years were not possible due to differences in survey methodology. Nest counts were lower throughout the UFR in 2022 relative to 2021, which may be associated with the cold early season water temperatures (Thorley et al. 2023b).

Lineal densities (i.e., densities calculated based on units of stream length, rather than stream area) of age-1 and age-2+ WCT were higher in Lower Greenhills and Gardine creeks relative to Upper Greenhills in 2022. This same pattern was observed based on consideration of all years with available data (Appendix C). Estimated abundance, which is calculated by multiplying density by the length of habitat, was higher in the isolated Upper Greenhills and Gardine creeks population (approximately 7 kilometres [km] of habitat) compared to Lower Greenhills (approximately 0.6 km of habitat). Densities are considered more reflective of local conditions than abundance, which is strongly driven by the amount of available habitat.

A qualitative assessment of the available density data (2015 to 2022²⁴) from Greenhills and Gardine creeks indicated that densities of age-1 (2020 to 2022) and age-2+ (2021 and 2022) WCT were similar. Estimated densities in Lower Greenhills Creek were highest in 2017 (age-1: 29 fish per 100 m; age-2+: 41 fish per 100 m) then declined to approximately 9 fish per 100 m by 2022 (Thorley et al. 2023a). A decline of similar magnitude over the same time period was also observed for WCT densities in Upper Greenhills and Gardine creeks (Thorley et al. 2023a). The observed temporal decreases in WCT densities coincided with a 74% decrease in the average density of juvenile fish (i.e., WCT less than 200 mm long) within the UFR in 2019 relative to 2017 (Cope 2020). Although the age-1 WCT in Lower Greenhills Creek in 2019 would have been from the first cohort exposed to antiscalant treatment, Upper and Lower Greenhills Creek have exhibited similar temporal patterns in age-1 and age-2+ WCT densities over time since 2017. Densities of age-1 and age-2+ WCT within the Greenhills Creek watershed have not returned to their pre-2019 levels (Thorley et al. 2023a).

The estimated mean length of age-0 WCT was larger in Lower Greenhills Creek relative to all other areas monitored as part of the UFR WCT Population Monitoring Program, including Upper Greenhills Creek and the UFR main stem. No age-0 WCT were captured in Upper Greenhills Creek, but the age-1 WCT were estimated to be smaller than those in Lower Greenhills Creek. These differences were attributed to higher water temperatures downstream from the Greenhills Creek Sedimentation Pond (Appendix C).

Fish from Upper and Lower Greenhills Creek and Gardine Creek were in similar condition to WCT captured from other areas of the UFR watershed in 2022 (Appendix C). Compared to Upper Greenhills and Gardine creeks (1%, compatibility interval = -2% to 6%), estimated WCT condition was lower in Lower Greenhills Creek (-1%; compatibility interval = -5% to 2%), based on a 100 mm WCT in a typical year and sub-population. However, given the difference between areas is only 2% and the level of uncertainty in the estimates, it is considered unlikely that any potential spatial differences in WCT condition within the Greenhills Creek watershed are biologically meaningful.

The assessment of the estimated changes in fish condition over time identified similar temporal patterns in Upper and Lower Greenhills Creek (Appendix C). Specifically, estimated fish condition decreased between 2017 and 2021 (i.e., from 9% to -6%) in Upper Greenhills Creek and between 2017 and 2020 (i.e., from 3% to -6%) in Lower Greenhills Creek, relative to a typical year and UFR sub-population. Fish condition in both monitoring areas improved in the years that followed.

²⁴ Although WCT monitoring was completed in the Greenhills Creek watershed in 2018, neither density nor abundance estimates for 2018 are available in the current UFR model because no WCT monitoring was completed in the main stem of the UFR in 2018 (Thorley et al. 2023a).



In 2022, the condition of a 100 mm fish from Upper Greenhills Creek was estimated to be 5% higher relative to a typical year and UFR sub-population. Similarly, condition of WCT from Lower Greenhills Creek in 2022 was estimated to be 1% higher relative to a typical year and sub-population (Appendix C).

No external anomalies or parasites were reported for the WCT captured from within the Greenhills Creek watershed in 2022 (*unpublished data*).

4 SUMMARY

This report summarizes the 2022 results of the GC LAEMP. Data collected to support the GC LAEMP in 2022 were compiled and summarized along with data from previous years of monitoring and other relevant studies (e.g., the Regional Calcite Monitoring Program and RAEMP) to address three key questions:

- 1. What is the current status of aquatic health in Greenhills and Gardine creeks, as evidenced by physical, chemical, and biological conditions?
- 2. Have physical, chemical, and/or biological conditions indicative of aquatic health in Greenhills and Gardine creeks changed over time and are the changes unexpected based on the activities and projects occurring in the watershed?
- 3. Can observed changes be linked to: antiscalant addition in Lower Greenhills Creek; activities to support relocation of the antiscalant addition facility to Upper Greenhills Creek; or initiation of antiscalant addition on Upper Greenhills Creek starting in October²⁵, 2022.

Monitoring was undertaken in 2022 to describe current conditions in Greenhills and Gardine creeks and the Greenhills Creek Sedimentation Pond (Question 1) and support comparisons to historical monitoring data (Question 2). To address Question 3, comparisons were made among the treated area on Lower Greenhills Creek versus untreated areas on Upper Greenhills Creek before and after initiation of treatment in 2017 and, where appropriate, reported results were also examined in light of relocation of the AAS to Upper Greenhills Creek in fall 2022.

Characterizing conditions within the Greenhills Creek watershed and addressing the three study questions highlighted the following key findings for Upper Greenhills and Gardine creeks:

- Aqueous concentrations of TDS, sulphate, and dissolved nickel were above screening values, updated EC, and proposed benchmarks, respectively, more frequently in Greenhills Creek relative to Gardine Creek, and Gardine Creek was a source of dilution for some constituents.
- Condition estimates for WCT from Upper Greenhills and Gardine creeks were higher in 2022 versus 2021 and were comparable to those for WCT captured elsewhere in the UFR watershed in 2022.

Aqueous concentrations of TDS, sulphate, and dissolved nickel were above screening values, updated EC, and proposed benchmarks, respectively, more frequently in Greenhills Creek relative

²⁵ The AAS has been operating intermittently on Upper Greenhills Creek since November 7, 2022.



to Gardine Creek, and upper Gardine Creek in particular. Of these constituents, dissolved nickel was the only one that exhibited a consistent spatial pattern within Greenhills Creek; concentrations decreased within increasing distance downstream and exhibited patterns of dilution downstream from the Gardine Creek confluence. Although there are upstream-to-downstream differences in water quality within Gardine Creek that are attributed to the seeps from the GHO Coarse Coal Rejects, Gardine Creek continues to act as an overall source of dilution for some mine-related constituents in Upper Greenhills Creek.

The WCT that can access and use habitats in Upper Greenhills and Gardine creeks and the Greenhills Creek Sedimentation Pond represent an isolated population. Total benthic invertebrate abundances on Upper Greenhills Creek were typically below the reference area normal range, potentially due to water quality and/or calcite conditions. Benthic invertebrate biomass on Upper Greenhills Creek was also lower relative to Lower Greenhills Creek. However, in 2022, fish condition estimates for WCT from Upper Greenhills and Gardine creeks were higher relative to 2021, and were comparable to those for WCT captured elsewhere in the UFR watershed in 2022.

The key findings for the Greenhills Creek Sedimentation Pond are as follows:

- Consistent with 2021, there is evidence for enhanced formation of organoselenium species resulting from processes within the pond and carry-over effects to lotic habitats downstream.
- Potential selenium-related risks to WCT feeding on benthic invertebrates originating from
 within the pond in 2022 were likely similar to 2018, when selenium concentrations in
 benthic invertebrate tissues were above EVWQP Level 1 Benchmarks and mean
 estimated WCT ovary selenium concentrations were above the EVWQP Level 2
 Benchmark for reproductive effects.

Aqueous concentrations of mine-related constituents in the Greenhills Creek Sedimentation Pond were generally comparable to those reported upstream and downstream; however, concentrations of organoselenium species tended to be higher downstream from the pond in 2022. These results are consistent with 2021, as are the results for selenium concentrations in benthic invertebrate tissues, which tended to reflect spatial patterns in aqueous selenium speciation (i.e., tissue selenium concentrations were higher within and downstream from the pond relative to upstream).

Selenium concentrations in benthic invertebrate tissues provide insight into potential risks to WCT and how risks related to dietary selenium exposure vary among areas and/or over time within an area. Concurrent benthic invertebrate and WCT tissue chemistry sampling within the pond was

last completed in 2018 and the results were indicative of potential risks to WCT reproduction. Although no WCT tissue sampling has been completed in the pond since 2018, the benthic invertebrate tissue selenium data suggest that WCT consuming invertebrates originating from within the pond were likely exposed to similar dietary selenium concentrations in 2018 and 2022.

In addressing the three study questions for 2022, the following key findings were identified for Lower Greenhills Creek:

- Concentrations of mine-related constituents (except molybdenum) in Lower Greenhills
 Creek have not changed significantly over time relative to upstream following
 antiscalant addition (October 2017 to August 2022).
- Calcite presence and concretion were lower in Lower Greenhills Creek relative to Upper Greenhills Creek in 2022 and, due to the effectiveness of antiscalant addition, C_c values in Lower Greenhills Creek have decreased relative to 2017 (i.e., relative to pre-treatment).
- Based on comparisons to pre-treatment data, %Ephemeroptera in benthic invertebrate community samples from Lower Greenhills Creek (treated) have increased relative to Upper Greenhills Creek (untreated).
- Condition estimates for WCT from Lower Greenhills Creek were higher in 2022 versus 2020 and were comparable to those for WCT captured elsewhere in the UFR watershed in 2022.
- Age-0 WCT from Lower Greenhills Creek were estimated to be longer relative to age-0 fish elsewhere in the UFR watershed, likely due to warmer water temperatures downstream from the pond.

Aqueous concentrations of mine-related constituents downstream from the AAS have not changed significantly over time relative to Upper Greenhills Creek following treatment. Molybdenum is the only exception, but molybdenum is a component of the antiscalant compound and, although concentrations were higher following treatment, they were below the BC WQG. Concentrations of mine-related constituents in Lower Greenhills Creek have not undergone unexpected changes relative to upstream following the application of antiscalant and adverse effects to aquatic biota following antiscalant addition are considered unlikely.

Calcified substrates were present throughout Greenhills Creek in 2022; however, C_p and C_c values were significantly lower downstream from the historical AAS location relative to Upper Greenhills Creek. Since 2017, C_p values within Lower Greenhills Creek have remained fairly consistent, but C_c values showed signs of improvement starting in 2019. These results indicate that antiscalant addition between October 2017 and August 2022 was successful at preventing

further calcite deposition in Lower Greenhills Creek, and recent monitoring results indicate that C_c has decreased between 2021 and 2022.

The %Ephemeroptera in benthic invertebrate community samples from Lower Greenhills Creek have increased relative Upper Greenhills Creek based on comparisons to data for 2016 and 2017. The increases in %Ephemeroptera, which are less tolerant of degraded conditions, following initiation of antiscalant addition in Lower Greenhills Creek are considered indicative of improvements in calcite conditions downstream from the AAS (i.e., prevention of further calcite deposition and lower C_c scores). The higher benthic invertebrate biomass in Lower Greenhills Creek suggests that the availability of food for fish was potentially better in Lower Greenhills Creek relative to upstream in 2022.

Lower Greenhills Creek is accessible to WCT from the UFR population and is used for spawning. Additionally, the warmer water temperatures downstream from the pond appear to support age-0 WCT in achieving larger body sizes relative to age-0 WCT in other areas of the UFR watershed. By achieving larger body sizes before their first winter, age-0 fish are expected to have a better chance of overwintering survival, and may also be able to better withstand other stressors. Finally, condition estimates for WCT from Lower Greenhills Creek in 2022 were higher relative to 2020 and were comparable to those for WCT captured elsewhere in the UFR watershed. However, fish that feed within Lower Greenhills Creek may be at greater risk of selenium-associated reproductive effects, given the elevated selenium concentrations in benthic invertebrates originating from within the Greenhills Creek Sedimentation Pond and Lower Greenhills Creek.

The results of the 2022 GC LAEMP will be summarized in Teck's upcoming AMP reports, as appropriate. The results of this study also supported the evaluation of biological triggers, which are intended to identify unexpected monitoring results that may lead to responses under the AMP framework.

Biological triggers for %EPT were exceeded on Upper (RG GHNF) and Lower (RG GHCKD) Greenhills Creek in 2022, whereas the biological trigger for selenium concentrations in benthic invertebrate tissues was only exceeded on Lower Greenhills (RG GHCKD and RG GHBP). Because the exact cause of the biological responses associated with the %EPT biological trigger are uncertain, monitoring of biological triggers and community endpoints will continue in 2023, along with other efforts (i.e., predictive modelling) to resolve uncertainty around effects of mine-related stressors on benthic invertebrate communities. The biological trigger exceedances for benthic tissue selenium at the monitoring areas on Lower Greenhills Creek are likely attributed to their proximity to, and being downstream from, the Greenhills Creek Sedimentation Pond discharge.

5 RECOMMENDATIONS

In completing the data collection, analysis, and interpretation steps associated with the 2022 annual report for the GC LAEMP, the study team identified needs and opportunities to adjust the 2023 study design to best capture the influences and activities within the Greenhills Creek watershed. Additionally, the 2023 study design represents an opportunity to adapt the GC LAEMP to reflect our current understanding of the watershed (i.e., what questions have been answered, with confidence, and which questions still need to be addressed?). The study design for the 2023 GC LAEMP program will be submitted to the Director and EMC prior to implementation in September 2023; however, the study team has the following recommendations, which were discussed with the EMC on May 2, 2023:

- Sediment chemistry analyses to evaluate differences among areas and years should focus on bulk sediment samples and SEA should be discontinued at all GC LAEMP sampling areas starting in 2023. Overall, the distribution of constituent concentrations among the sediment fractions has been comparable among years, and adding additional years of data is not expected to provide additional information. The bulk sediment chemistry data (moisture, particle sizes, TOC, metals, and PAHs) will allow for spatial and temporal contrasts (2019 to 2023) that can then be used to address the GC LAEMP study questions.
- The focus of data analyses for the effects assessment associated with antiscalant addition should shift to Upper Greenhills Creek, where the AAS is currently operating. The BACI analyses (e.g., for water chemistry) and other comparisons should be adjusted so that monthly water quality monitoring stations and biological monitoring areas downstream from the current AAS location (e.g., RG_GHDT and RG GHFF) are included in the "treated" rather than "untreated" data set.
- The biological triggers analysis for Upper Greenhills Creek should be updated to better reflect the availability of water quality projections and biological data. In the May 2, 2023 EMC meeting, the study team proposed pairing biological data for RG_GHNF and RG_GHDT with water quality projections for GH_CTF and GH_HWGH_BRB, respectively. However, the study team has since confirmed that there is no water quality modelling node at GH_CTF and GH_HWGH_BRB is the most appropriate pairing for both RG_GHNF and RG_GHDT. The approach to evaluating biological triggers for Lower Greenhills Creek in 2023 will remain unchanged relative to 2022.

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APPENDIX A DETAILED METHODS

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A1 WATER QUALITY

A1.1 Overview

Permit 107517 requires that Teck Coal Limited (Teck) prepare annual reports that summarize water quality monitoring data collected during the preceding calendar year at all sampling locations specified in the permit and as part of Local Aquatic Effects Monitoring Programs (LAEMPs). Within the Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP) and each of the other LAEMPs identified in Permit 107517, water chemistry and aqueous selenium speciation samples are collected at biological monitoring areas, concurrent with benthic invertebrate community and/or tissue chemistry sampling. Methods employed as part of the GC LAEMP in 2022 are described in the following sub-sections, along with key methodological details for monitoring completed by Teck (e.g., monthly water quality sampling) or part of other as programs (e.g., the Selenium Speciation Monitoring Program).

A1.2 Field Sampling

A1.2.1 Creeks

Water samples and associated *in situ* measurements are collected monthly at each of Teck's routine monitoring stations (and weekly for certain constituents at GH_GH1 on Lower Greenhills Creek from March 15 to July 31) (see Section A.1.3). *In situ* water quality measurements include temperature, dissolved oxygen (DO), pH, specific conductance, and turbidity.

Water chemistry and aqueous selenium speciation samples were collected at each targeted biological monitoring area in February and September 2022 to support GC LAEMP. Sample collection procedures were consistent with those outlined in the British Columbia Field Sampling Manual (Province of British Columbia 2013). In situ water quality measurements including temperature, DO, pH, and specific conductance were taken concurrent with all water chemistry and selenium speciation Α calibrated YSI ProDSS samples. (handheld multi-parameter meter equipped with four Digital Sampling System sensors; YSI Inc., Yellow Springs, Ohio) was used to collect *in situ* water quality data.

Water samples were collected by wading into a mid-channel area, moving from downstream to upstream, so as not to collect water downstream of disturbed substrates. Samples were collected from mid-depth by inverting sample bottles below the surface of the water. Samples were taken to shore prior to field filtering or addition of any applicable preservatives. Water samples for analysis of dissolved constituents were filtered in the field using a clean

syringe affixed with a 0.45 micrometre (µm) filter membrane and then preserved immediately in the manner specified by the analytical laboratory. Information pertaining to the station location (i.e., Global Positioning System [GPS] coordinates) and the sample date, time, and identifier were recorded on field sheets. Samples were kept cold until analysis. Samples were shipped to the analytical laboratory daily or every other day to achieve compliance with recommended analytical hold times.

A1.2.2 Greenhills Creek Sedimentation Pond

The approach for collecting water chemistry and selenium speciation samples from RG_GHP, which represents deeper, depositional locations within Greenhills Creek Sedimentation Pond, was dependent on conditions encountered in the pond at the time of sampling. First, a calibrated YSI ProDSS was used to take a water quality profile at the deepest part of the pond to determine if stratification was present. Profile measurements (temperature, DO, pH, and specific conductance) were taken at 1 metre (m) intervals. Because no stratification was observed in 2022, a single grab sample was collected from just below the water surface.¹ Subsequent steps related to field notetaking and sample filtration, preservation, labelling, storage, and shipping were consistent with those described above for creek samples (Section A1.2.1).

A1.3 Laboratory Analysis

Water chemistry samples were shipped to ALS Environmental (ALS) in Calgary, Alberta (AB), which is a third-party analytical laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). The requested analyses were completed in accordance with procedures described in the most recent edition of the "British Columbia Laboratory Methods Manual" (Austin 2020) per Permit 107517 requirements (see also Table A.1). Laboratory quality assurance/quality control (QA/QC) included an assessment of the laboratory sensitivity (e.g., an evaluation of laboratory reporting limits [LRLs] and blank samples), accuracy (e.g., matrix spikes and laboratory control samples), and precision (e.g., laboratory duplicates).

Selenium speciation samples collected as part of the GC LAEMP in February and September 2022 were analyzed by Brooks Applied Labs, which is located in Seattle, Washington and is accredited by the National Environmental

¹ If distinct "layers" of water with differing temperature (e.g., an upper, warmer layer over a deeper, colder layer), DO concentration, pH, or specific conductance were evident from the profile measurements, then the water in Greenhills Creek Sedimentation Pond would have been considered "stratified". In this case, two separate water samples would have been collected: one from just below the surface and another just off the bottom of the pond.

Table A.1: Analytical Methods for Water Samples

Constituent	Units	Method	Reference
pH	pH units	pH electrode	APHA 4500 H-electrode
Turbidity	NTU	Nephelometric	APHA 2130 B
Hardness (as CaCO ₃)	mg/L	Calculation	APHA 2340B
Total Suspended Solids	mg/L	Gravimetric	APHA 2540 D
Total Dissolved Solids	mg/L	Gravimetric	APHA 2540 C
Alkalinity	mg/L	Potentiometric Titration	APHA 2320 B
Ammonia (as N)	mg/L	Fluorescence	Fialab 100, 2018
Bromide (Br)	mg/L	Ion Chromatography	EPA 300.1
Chloride (CI)	mg/L	Ion Chromatography	EPA 300.1
Fluoride (F)	mg/L	Ion Chromatography	EPA 300.1
Total Kjeldahl Nitrogen	mg/L	Fluorescence	FIAlab 100 (FIAlab 2018)
Nitrate (as N)	mg/L	Ion Chromatography	EPA 300.1
Nitrite (as N)	mg/L	Ion Chromatography	EPA 300.1
Phosphorus (P)-Total	mg/L	Colourimetrically	APHA 4500-P E
Orthophosphate	mg/L	Colourimetrically	APHA 4500-P F
Оппорнозрнате			(filtered through a 0.45 µm filter)
Sulphate (SO ₄)	mg/L	Ion Chromatography	EPA 300.1
Dissolved Organic Carbon	mg/L	Combustion	APHA 5310 B TOC
Dissolved Organic Carbon			(filtered through a 0.45 µm filter)
Total Organic Carbon	mg/L	Combustion	APHA 5310 B TOC
Total and Dissolved Metals	mg/L	CRC-ICPMS	APHA 3030 B/EPA 6020B, EPA 200.2/6020B
Total and Dissolved Metals			(dissolved metals filtered through a 0.45 µm filter)
Total and Dissolved Mercury	mg/L	CVAAS, CVAFS	APHA 3030B/EPA 1631E, EPA 1631E (dissolved
Total and Dissolved Mercury	mg/L		mercury filtered through a 0.45 µm filter)

Notes: APHA = American Public Health Association; NTU = nephelometric turbidity units; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; EPA = United States Environmental Protection Agency; μm = micrometres; TOC = total organic carbon; CRC-ICPMS = collision reaction cell inductively coupled plasma-mass spectrophotometry; CVAAS = cold vapour atomic absorption spectroscopy; CVAFS = cold vapour atomic fluorescence spectroscopy.

Laboratory Accreditation Program (NELAP). Concentrations of selenium species (dimethylselenoxide, methylseleninic acid, methaneselenonic acid, selenate, selenite, selenocyanate, selenomethionine, selenosulphate, and unknown selenium species) were quantified using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). This approach results in greater retention of methylseleninic acid and selenomethionine and subsequently improved quantitation of these selenium species. Laboratory QA/QC included an assessment of laboratory sensitivity (e.g., an evaluation of LRLs and blank samples), accuracy (e.g., matrix spikes and blank spikes) and precision (e.g., laboratory duplicates and matrix spike duplicates).

Laboratory QA/QC procedures associated with routine water sampling are described by Teck in annual water quality reports submitted under Permit 107517 and 6248. Laboratory QA/QC results for samples collected specifically to support the February and September 2022 GC LAEMP programs are evaluated in Appendix B of the main 2022 GC LAEMP report.

A1.4 Data Analysis

Preparation of the Elk Valley Water Quality Plan (EVWQP) required derivation of science-based benchmarks for nitrate, sulphate, cadmium, and selenium (Teck 2014). Risks associated with these constituents depend on their concentrations, concentrations of other water chemistry parameters known as exposure and toxicity modifying factors (ETMFs), and the sensitivity of aquatic receptors that could be exposed. The EVWQP benchmarks were derived, using a large body of published and site-specific information available at that time, to represent scientific best estimates of concentrations associated with no effects and defined levels of potential effect on chronic, sublethal endpoints for sensitive aquatic species. Margins of safety were incorporated in benchmark derivation to account for uncertainty and Teck committed to undertaking further studies and periodic updates to progressively reduce that uncertainty and improve confidence in the benchmarks.

Studies conducted to progressively reduce uncertainty in benchmarks have included additional chronic toxicity studies of nitrate, sulphate, cadmium, and selenium individually and in mixtures; annual evaluation of water quality under the regional chronic toxicity monitoring program; updates to selenium bioaccumulation models in 2017 and 2022; development of new tools to predict bioaccumulation in relation to selenium speciation; and, most recently, an extensive program of validation and updates to the science-based benchmarks under Teck's Adaptive Management Plan (AMP). This program was undertaken to answer Management Question (MQ) two under the AMP: "Will the aquatic ecosystem be protected by meeting the long-term site performance objectives?" and associated Key Uncertainty (KU) 2.1: "How will the science-based benchmarks be validated

and updated?". The MQ2 program was developed with input from the Elk Valley Environmental Monitoring Committee (EMC) and results have been shared with the EMC on an ongoing basis since the program began.

A key outcome of the MQ2 program was the development of an updated compilation of chronic toxicity information for nitrate, sulphate, and selenium, including information available at the time of EVWQP development and studies conducted after the EVWQP was finalized in 2014. For nitrate and sulphate, the updated compilation represented a substantial increase in available toxicity information for key test species. This updated compilation was used to validate EVWQP benchmarks and, where warranted, to derive Effect Concentrations (EC) that incorporate this new information (Golder 2022a). As in the EVWQP, the objective was to derive scientific best estimates of concentrations associated with no effects or defined levels of potential chronic, sublethal effect to sensitive species and life stages relevant to the Elk Valley. The analysis concluded that the updated EC for nitrate and sulphate are supported by a larger data set covering a wider range of conditions than was available at the time of the EVWQP, and thereby provide an improved basis for evaluating potential effects of these constituents (Golder 2022a). Data set comparisons for the EVWQP and updated EC for nitrate and sulphate are summarized in Table A.2.

Another key outcome of the MQ2 program was the implementation of updated selenium bioaccumulation models to translate between tissue-based effects benchmarks and associated aqueous selenium concentrations. Golder (2022a) concluded that tissue-based benchmarks derived for the EVWQP remain supported as a reliable basis for evaluating potential effects of bioaccumulated selenium. However, studies conducted since the EVWQP have provided an improved understanding of bioaccumulation, warranting a re-evaluation of aqueous selenium benchmarks. The bioaccumulation model developed for the EVWQP incorporated site-specific data from dozens of locations and decades of study and provided an accurate characterization of regional patterns of bioaccumulation in terms of mean selenium concentrations in biota and the observed variability around that mean. More recent study has provided an understanding of the factors driving variability around the modelled mean, which allows substantially more accurate predictions of bioaccumulation for any given location. In particular, it is now apparent that aqueous selenium speciation dominates patterns of bioaccumulation. Modelling approaches that account for speciation now represent the best available science and should be used to relate tissue and aqueous concentrations whenever possible.

Studies were not undertaken under the MQ2 program to update benchmarks for cadmium because work had already been conducted by the British Columbia Ministry of Environment

Table A.2: Approach for Updating Nitrate and Sulphate Effect Concentrations ^a

Test Species ^b	EVWQP Data Set and Approach	Updated Data Set and Approach					
Nitrate							
Ceriodaphnia dubia	Geometric mean of two (Elk River) or three (Fording River) tests; hardness slope from literature	Pooled analysis of 11 test and 11 hardness values; hardness-response model					
Rainbow trout	One test in Fording River water; hardness slope from literature	Pooled analysis of four tests at four hardness values; hardness-response model (Golder 2022a) $^{\rm c}$					
Amphibians	Literature data for two species	Northern leopard frog testing in simulated Fording River water; hardness-adjusted using pooled slope from EVWQP (1.0003)					
Sulphate							
Ceriodaphnia dubia	Geometric mean of lowest unbounded values from two rounds of site testing	Concentration-response analysis of pooled data from eight site water tests					
Neocloeon triangulifer ^d	Concentration-response analysis of pooled data from one site-specific water test	Concentration-response analysis of pooled data from one site- specific site water test and site-relevant test from the literature					
Rainbow trout	Geometric mean of literature and site-specific data	Concentration-response analysis of pooled data from four site water tests (Golder 2022a) $^{\rm c}$					
Amphibians	Literature data for Pacific tree frog	Northern leopard frog testing in simulated Fording River water					

Notes: EVWQP = Elk Valley Water Quality Plan; EC = Effect Concentration; EMC = Environmental Monitoring Committee.

^a Modified from Golder (2022).

^b Updated EC were not calculated for *Hyalella azteca* (nitrate) because no new site-specific testing for this species was conducted subsequent to the EVWQP benchmark derivation (Teck 2014).

^c Per discussions with the EMC on June 23, 2021 and analyses presented in Golder (2022a), replicates with microbial observations were excluded from the models used to derive updated EC. A fifth nitrate test was conducted (GH_FR1-HH), but was excluded because of reduced survival in all treatments, including the unamended water (Golder 2022a).

^d Inclusion of updated EC for *Neocloeon triangulifer* exposed to sulphate was not discussed at the June 2019 EMC meeting but was incorporated after identifying a site-relevant literature study.

and Climate Change Strategy (ENV/BCMOECCS) that supported the protectiveness of cadmium benchmarks and site performance objectives (SPOs). The British Columbia Water Quality Guideline (BC WQG) for cadmium, which was developed after the EVWQP, adopted a slightly higher concentration as protective of all species and stages of aquatic life across the province. Furthermore, Teck's water quality monitoring data have indicated that cadmium concentrations are consistently below both guidelines and SPOs, and cadmium has not been implicated in aquatic effects through chronic toxicity or biological monitoring programs in the Elk Valley.

In addition to the EVWQP and MQ2 programs, Teck has continued to develop tools to support the assessment and management of key water quality parameters. Most notably, Teck has undertaken a multi-year program to develop benchmarks for nickel. This work was prompted by unexpected and unexplained responses in invertebrate toxicity monitoring combined with observed changes in benthic invertebrate community structure immediately downstream of the Coal Mountain Mine. Initial investigations identified nickel as the most likely cause. A program was undertaken that combined published and site-specific toxicity testing with biological monitoring data from across the Elk Valley to derive benchmarks that would support an interpretation for nickel similar to the EVWQP benchmarks and updated EC discussed above. Studies were developed with input from the EMC and results were shared with the EMC throughout the program. Proposed nickel benchmarks were reported in 2022 (Golder 2022b) and submitted to the EMC and ENV/BCMOECCS per permit 107517 requirements.

To support the GC LAEMP in 2022, water quality data from Teck's monthly (routine) monitoring stations were compared to the EVWQP benchmark for dissolved cadmium, screening values for total dissolved solids (TDS), updated EC², the proposed benchmark for nickel, BC WQG for the protection of freshwater aquatic life, and the Canadian Council of Ministers of the Environment (CCME) guideline for total mercury³ (BCMOECCS 2021a,b; BCMWLRS 2023; CCME 2003; Golder 2022a,b; Teck 2014), as appropriate. Water chemistry and selenium speciation data collected from biological monitoring areas in 2022 were also compared to applicable benchmarks, updated EC, BC WQG, and the CCME guideline for total mercury but were not subjected to statistical analyses due to limited sample sizes.

³ The CCME guidelines for mercury were used in lieu of the BC WQG because mercury inputs (total and methyl) in the Elk River watershed are not related to mine activities (Azimuth 2019) and Teck received approval to use the CCME guideline from ENV/BCMOECCS on January 17, 2022.



² There are BC WQG and updated EC for nitrate and sulphate; however, comparisons were made to the updated EC because these are considered more relevant and site-specific than the BC WQG.

Selenium speciation data collected as part of the Selenium Speciation Monitoring Program were used, as appropriate, to support data interpretation (ADEPT et al. 2023).

Water chemistry data were compared among Teck's routine monitoring stations on Greenhills and Gardine creeks to evaluate potential mine-related influences on water quality. The analyses focused on constituents with Early Warning Triggers (EWTs; Azimuth 2018; Teck 2018, 2021) (i.e., TDS, nitrate, nitrite, sulphate, total antimony, total barium, total boron, total lithium, total manganese, total molybdenum, total nickel, total selenium, total uranium, total zinc, dissolved cadmium, and dissolved cobalt). Concentrations of these constituents were plotted with applicable benchmarks, updated EC, and guidelines to allow for qualitative comparisons among stations. Statistical comparisons were based on monthly mean concentrations and were completed using a censored regression Analysis of Variance (ANOVA) fit using Maximum Likelihood Estimation with an assumed log-normal distribution. When the overall p-value from the ANOVA was significant, the *post hoc* Tukey's Honestly Significant Difference (HSD) Test was used to compare among individual stations.

Concentrations of mine-related water quality constituents with EWTs were compared among years for each one of Teck's routine monitoring stations. Data collected from 2016 to 2022 were used; however, the analysis was restricted to years with at least six months of data and stations with at least two years of data. Differences in monthly mean concentrations over the years for each station were tested using a censored regression ANOVA with factors Year and Month, assuming a log-normal distribution. Monthly mean concentrations were estimated using the Kaplan-Meier (K-M) method. The method involves transforming the left censored (i.e., less than [<] value) data set to a right censored (i.e., greater than [>] 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 calculations were completed using the survfit() function in the survival package (Therneau 2017) in R (R Core Team 2022) and involved calculating the area under the K-M survival curve. The K-M method is non-parametric and can accommodate multiple LRLs. This method of estimating the mean is equivalent to using the distribution of detectable values below the LRL to represent values that are <LRL. 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).

For each year, a percent magnitude of difference (MOD) relative to the base year (i.e., first year with at least six months of data) was calculated as:

$$\frac{\textit{Year}_i - \textit{Base Year}}{\textit{Base Year}} \times 100 \%$$



with the annual concentrations represented by the estimated marginal means from the ANOVA model. Significant differences between the study year of interest (*Year_i*) and all other years were assessed.

Potential effects to water quality from antiscalant addition on Lower Greenhills Creek were evaluated by comparing May to September means for water quality constituents measured in samples collected from 2017 to 2022 (Minnow 2022a,b).4 Differences in aqueous concentrations of mine-related constituents observed downstream from the antiscalant addition system (AAS) on Lower Greenhills Creek relative to upstream both before and after the introduction of antiscalant treatment were compared using a Before-After-Control-Impact [BACI] design. A two-way ANOVA with factors Area and Year were used to evaluate the difference between monthly mean values at GH_GH2 and GH_GH1, which are downstream and upstream from the AAS on Lower Greenhills Creek, respectively. Water chemistry data collected prior to initiation of calcite management on October 23, 2017, were used to represent the "before" period and data collected thereafter were used to represent the "after" period. Because sampling at GH GH2 started in May 2017, an evaluation of seasonal differences between GH GH1 and GH GH2 in the absence of calcite management could not be completed for this study. Hence, the analyses completed to date for Lower Greenhills Creek have focused on May to September data.

When the overall p-value from the ANOVA was significant, the *post hoc* Tukey's HSD Test was used to compare among years. For significant comparisons, a MOD was calculated as the relative difference between observed and predicted post-treatment concentrations at GH GH2:

$$MOD = \frac{GH_GH2_{observed\ post-treatment} - GH_GH2_{predicted\ post-treatment}}{GH_GH2_{predicted\ post-treatment}} \times 100\%$$

where $GH_GH2_{observed\ post_treatment}$ is the geometric mean for monthly mean constituent concentrations calculated for GH_GH2 post-treatment, and $GH_GH2_{predicted\ post_treatment}$ is the predicted mean concentration for GH_GH2. The predictions assume that the ratio of concentration of GH_GH1 to GH_GH2 is the same as pre-treatment:

⁴ The AAS was not operating in May 2018, September 2019, or May 2020; consequently, data for these months were excluded from the "after" data set, consistent with previous years (Minnow 2020, 2021, 2022b). Additionally, since the AAS ceased to operate on Lower Greenhills Creek in August 2022, the September 2022 data were excluded from the "after" data set.

$$\begin{split} GH_GH2_{predicted\ post-treament} \\ &= 10^{\lceil log_{10} \left(GH_GH2_{post-treatment} \right) + log_{10} \left(GH_GH2_{pre-treatment} \right)} \\ &- log_{10} \left(GH_GH1_{pre-treatment} \right)] \end{split}$$

Potential differences between 2017 and each of the post-treatment years (i.e., 2018 to 2022) were assessed.

All data analyses were completed using R statistical software (R Core Team 2022).

A2 SUBSTRATE QUALITY

A2.1 Overview

Aquatic habitats of the Elk River watershed are predominantly lotic with coarse bottom substrates (e.g., cobbles and gravels). Calcite (calcium carbonate precipitate) has been observed in several creeks within the Elk River watershed downstream from Teck's mines and, to a lesser extent, in reference creeks unaffected by mining. In parts of some creeks, including Greenhills Creek, calcite precipitation completely covers portions of the creek bed, making the substrate largely immovable. Permit 107517 requires that Teck monitor and report on calcite conditions within mine-exposed creeks in the Elk River watershed, and this reporting is completed annually as part of the Regional Calcite Monitoring Program and LAEMPs.⁵

The main mine-related constituents (e.g., nitrate, selenium, sulphate) are highly soluble, chemically stable in water, and do not tend to adsorb to particles, so potential effects to aquatic organisms from these substances are expected to occur predominantly via water rather than sediment exposure pathways (and predominantly from dietary exposure for selenium). Additionally, off-channel areas such as oxbows, wetlands, ponds, and small lakes, where fine sediments can accumulate over time, are sparsely distributed, and represent a relatively small proportion of the aquatic habitat within the watershed (IRCL 2008). However, in the sparsely distributed lentic areas with elevated oxygen demand and longer residence time (relative to lotic areas) aqueous selenate near the sediment-water interface may be microbially reduced to insoluble forms (e.g., selenides). As a result, sediments in these lentic environments can act as a sink for selenium (Martin et al. 2011).

A2.2 Calcite

A2.2.1 Field Sampling

Calcite in Greenhills and Gardine creeks was monitored at the following locations in 2022 as part of the Regional Calcite Monitoring Program for Teck:

 GREE3-25, GREE3-50, GREE3-75, GREE4-25, GREE4-50, and GREE4-75 on Upper Greenhills Creek;

⁵ Data are also collected annually as part of Teck's Regional Aquatic Effects Monitoring Program (RAEMP); however, RAEMP data are reported on a three-year, rather than annual, cycle.

- GREE1-25, GREE1-50, and GREE1-75 on Lower Greenhills Creek; and
- GARD1-25, GARD1-50, and GARD1-75 on Gardine Creek.

Calcite monitoring methods employed for the Regional Calcite Monitoring Program in 2022 were consistent with those described previously by Lotic Environmental Ltd. (Lotic) (Smit and Robinson 2023; Zathey et al. 2021). From 2015 to 2020, data collected from Reach 1 of Gardine Creek as part of the Regional Calcite Monitoring Program were reported as an average of three stations. However, data for 2021 and 2022 were reported separately for each of the three stations (i.e., GARD1-25, GARD1-50, and GARD1-75) on Gardine Creek (Robinson et al. 2022; Smit and Robinson 2023).

As of the September 2022 GC LAEMP sampling, field staff part from Minnow Environmental Inc. (Minnow) collected calcite data from the immediate vicinity of each area-based benthic invertebrate creek sampling station (i.e., RG GHUT, RG GHNF, RG_GHDT, RG_GHFF, RG_GHBP, RG_GAUT, and RG_GANF [six stations per biological monitoring area]). The goal was to support direct comparisons of benthic invertebrate community endpoints with calcite index (CI) and calcite index prime (CI') values. Calcite measurements were made on 50 randomly selected pebbles, rather than 1006, at each benthic invertebrate community sampling station (i.e., for a total of 300 pebbles per biological monitoring area, which is consistent with the resolution applied for LAEMP and Regional Aquatic Effects Monitoring [RAEMP] areas).

Calcite index measurements were made using methods that were described in detail by Zathey et al. (2021) and summarized in Lotic (2021). Briefly, the presence (C_p ; score = 1) or absence (score = 0) of calcite was recorded to estimate CI, consistent with previous years (Minnow 2020a, 2021, 2022b). The proportional presence score (i.e., calcite presence prime $[C_p]$) was also recorded; C_p ' represents the proportion of a given particle's surface area that is covered in calcite (e.g., C_p ' = 0.2 for a particle with 20 percent [%] calcite coverage). If calcite is absent, C_p ' = 0 and for full coverage, C_p ' = 1 (Zathey et al. 2021). Next, the degree of concretion (C_p) was recorded based on the particle being removed with negligible resistance (not concreted; score = 0), removed with noticeable resistance but removable (partially concreted; score = 1), or 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. If a thick (i.e., >1 centimetre [cm]) layer of fines was present and calcite presence could not be visually confirmed, then the fines were pinched between the thumb and

⁶ For the other LAEMPs and the RAEMP, 100 pebbles are counted at each of three stations per biological monitoring area, for a total of 300 pebbles per biological monitoring area, consistent with the GC LAEMP.

fingers and evaluated for calcite presence (i.e., rubbed to detect the presence of brittle, calcite conglomerates). If the fines consisted of calcified conglomerates in loose sediment, then values of 0 (for concretion) and 1 (for presence) were recorded (Lotic 2021). If conglomerates were not observed, then concretion and presence values were recorded as 0. If moss was present on a particle, the moss was removed to determine if calcite was present. If calcite was present, values of 1 (for presence) and 0 (for concretion, when moss was easily removed) were recorded. If the moss could not be removed, but there was calcite-induced resistance, a value of 1 (for concretion) was recorded. If the moss was fully encrusted and immovable, values of 2 (for concretion) and 1 (for presence) were recorded If a rock was visible under fines, the rock was selected for (Lotic 2021). calcite index measurements.

A2.2.2 **Data Analysis**

Two different methods were used to calculate calcite indices for the biological monitoring areas sampled as part of the GC LAEMP in 2022. The first method relied on the binary (0 [absent] or 1 [present]) C_p scores used historically and in 2021 (e.g., Minnow 2020a, 2021, 2022b; see also Teck 2016). The second method, which was first implemented as part of the GC LAEMP in 2021 (Minnow 2022b), was based on the updated methods described by Zathey et al. (2021) (see also Lotic 2021). The updated methods required the use of C_p' (proportional score) in place of C_p (binary score), to quantify calcite presence.

Using the methods from Teck (2016), the CI were calculated as:

$$CI = C_p + C_c$$

where:

 $CI = Calcite\ Index$

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

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

Using the updated methods described by Zathey et al. (2021), Cl' was calculated as:

$$CI' = C_p' + C_c$$

where:

 $CI' = Calcite\ Index\ Prime$

$$C_p$$
' = Calcite Presence Score Prime = $\frac{Sum\ of\ proportional\ presence\ scores}{Number\ of\ particles\ counted}$
 C_c = Calcite Concretion Score = $\frac{Sum\ of\ particle\ concretion\ scores}{Number\ of\ particles\ counted}$

Differences in calcite presence and concretion scores among areas and years were compared using a Generalized Linear Mixed Model (GLMM) with factors Area and Year and Area x Year. A negative binomial distribution was assumed and a random effects term (replicate nested in area) was used to account for replicated counts within an area. Post hoc contrasts were conducted when the main effects or interaction terms were significant ($\alpha = 0.05$). For significant post hoc comparisons among years, the MOD was calculated as:

$$\frac{Score_{year} - Score_{2017}}{Score_{2017}} \times 100 \%$$

where Score is the estimated calcite presence or concretion score in a given year and Score₂₀₁₇ is the presence or concretion score in the baseline (i.e., pre-treatment) year (i.e., 2017). Similarly, the MODs between areas with significant post hoc contrasts were calculated as:

$$\frac{Score_{untreated} - Score_{RG_GHBP}}{Score_{RG_GHBP}} \times 100 \%$$

where Scoreuntreated represents the estimated calcite presence or concretion score for an area other than RG GHBP (i.e., any area that is on Upper Greenhills Creek and was therefore not yet subject to antiscalant addition) and Score_{RG} _{GHBP} is the presence or concretion score for RG GHBP (the area on Lower Greenhills Creek that was receiving antiscalant treatment).

Statistical analyses were completed in R (R Core Team 2022). Calcite presence (C_p and C_p') and concretion scores were also plotted by area to support visual (i.e., qualitative) comparisons among areas and over time within areas. Additionally, CI and CI' were used to support interpretation of benthic invertebrate community data (i.e., by correlation analysis of benthic invertebrate community endpoints and calcite scores). Lastly, results from the 2022 Regional Calcite Monitoring Program were integrated into the interpretation of calcite data for the GC LAEMP, as appropriate.

A2.3 Sediment

A2.3.1 Field Sampling

A2.3.1.1 Creeks

chemistry samples (five replicates per area) were collected Lower Greenhills Creek (RG GHBP) and Gardine Creek (RG GAUT and RG GANF) in September 2022. Sampling was completed by individuals on foot and sampling locations were approached in such a way as to avoid disturbance of sediments before sampling. To the extent possible, the same locations sampled for sediment in previous years (i.e., 2017 to 2021) were sampled again in 2022. A handheld GPS was used to mark the Universal Transverse Mercator (UTM) coordinates of each sediment sampling location. A stainless-steel spoon was used to sample the top 1 to 2 cm of fine sediment deposits.⁷ Sediment was collected until sufficient volume was obtained for the required analyses. The sediment collected from a given sampling location was deposited into a clean plastic tub, homogenized, photographed, and divided between a 250 millilitre (mL) glass jar and a large, labelled plastic bag provided by the analytical laboratory (i.e., ALS). Samples were placed in a cooler with ice following collection and transferred to a refrigerator until shipment to the analytical laboratory. Details pertaining to the samples (e.g., depth, substrate characteristics, colour, texture, and presence of aquatic vegetation) and observations of calcite presence (e.g., based on sample texture and colour) were recorded on field sheets. Field QA/QC measures included the collection of field duplicates at a minimum frequency of 10% of total samples collected during the sampling program.

A2.3.1.2 Greenhills Creek Sedimentation Pond

Sediment samples were collected from Greenhills Creek Sedimentation Pond, which represents the main deposition area for fine sediments originating from Upper Greenhills Creek, by deploying a stainless-steel Petite Ponar grab sampler from a boat. A single sample, consisting of a composite of the top 2 cm of five to 10 grabs was collected at each of six sediment sampling stations (i.e., RG_GHP-1, RG_GHP-2, RG_GHP-3, RG_GHP-4, RG_GHP-5 and RG_GHP-6) in 2022. Care was taken so that each grab captured the surface material and was full to each edge. Incomplete grabs were discarded. Grabs deemed to be of sufficient fullness and quality were deposited into a clean plastic tub, homogenized, photographed, and split between a 250 mL glass jar and a large, labelled plastic

⁷ On one occasion at RG GHBP, sediment had to be collected by brushing sediment off rocks.



bag provided by the analytical laboratory (i.e., ALS). Sample storage, field data recording, and QA/QC procedures were consistent with those described above in Section A2.3.1.1.

A2.3.2 **Laboratory Analysis**

Sediment chemistry samples were sent to ALS, a CALA-certified laboratory, in Calgary, AB for analysis. The laboratory was instructed to thoroughly homogenize each sediment sample, as per standard laboratory protocols, so that sub-samples were representative and comparable. Separate sub-samples were taken from samples submitted in plastic bags for analysis of moisture content, particle size, total organic carbon (TOC), and bulk metals. Additional sub-samples were also taken from the plastic bags and subjected to sequential extraction analysis (SEA) for metals (see below). Sediment sample fractions submitted in glass jars were used for analysis of polycyclic aromatic hydrocarbons (PAHs).

Bulk sediment chemistry samples were analyzed using the following methods:

- Metals by Collision Reaction Cell Inductively Coupled Plasma-Mass Spectrometry (CRC-ICPMS; United States Environmental Protection Agency [EPA] 6020B mod);
- Mercury by Cold Vapour Atomic Absorption Spectroscopy (CVAAS; EPA 200.2/1631 Appendix mod);
- TOC calculated from total and inorganic carbon (Canadian Society of Soil Science [CSSS] [2008] 21.2)8;
- Inorganic Carbon as a calcium carbonate (CaCO₃) equivalent calculation;
- PAHs by tumbler extraction using hexane/acetone (EPA 8270E (mod)) followed by capillary column gas chromatography with mass spectrometric detection (GC/MS);
- Particle size distribution by dry sieving (coarse particles), wet sieving (sand), and the pipette sedimentation method (fine particles);
- pH by 1:2 soil:water extraction (Austin 2020); and
- Moisture content by gravimetry (i.e., weighing the sample before and after drying at 105 degrees Celsius [°C]).

The SEA were performed in accordance with Tessier et al. (1979). The method involves five sequential extraction steps; each extraction step represents a different fraction of

⁸ Total carbon and inorganic carbon content are determined by combustion methods (CSSS [2008] 21.2 (mod)) and reaction with acetic acid (CSSS [2008] 20.2), respectively.

sediment-associated metals that could potentially be released under specific conditions. These include:

- 1. Fraction 1 (exchangeable and adsorbed metals fraction) potentially released due to changes in ionic strength;
- 2. Fraction 2 (carbonate fraction) potentially released due to changes in pH;
- 3. Fraction 3 (easily reducible metals and metals bound to iron and manganese oxides) potentially released under reducing conditions;
- 4. Fraction 4 (metals bound to organic matter) potentially released under oxidizing conditions; and
- 5. Fraction 5 (residual metals) metals resistant to the first four digestion steps (Tessier et al. 1979).

Extraction of the residual metals fraction (fraction 5) involves digestion with a strong acid (an equal (1:1) mix of 1:1 nitric and 1:1 hydrochloric acids) to mobilize metals resistant to the first four digestion steps, and is the same digest used to extract total metals in the conventional chemical characterization of "total" or bulk metals in sediments.

Laboratory QA/QC included an assessment of sensitivity (e.g., evaluations of LRLs and blank samples), accuracy (laboratory control samples and internal reference materials), and precision (e.g., laboratory duplicates) (see Appendix B of the main report).

A2.3.3 Data Analysis

Metal and PAH concentrations in sediment samples were tabulated and plotted to support comparisons to applicable BC Working Sediment Quality Guidelines⁹ (BC WSQG; BCMOECCS 2021b). Concentrations in bulk sediment and the sums of concentrations in sediment fractions 1 to 4 were included in the comparisons.¹⁰ The upper and lower BC WSQG were included in the evaluation, recognizing that the BC WSQG are based on co-occurrence analysis, rather than on cause-effect studies, (BCMOECCS 2021b). The lower BC WSQG represent concentrations below which adverse biological effects would not be expected to occur under most circumstances and are considered comparable to or are set equal to the CCME Threshold Effects Levels or Interim Sediment Quality Guidelines

¹⁰ Comparison of the sum of sediment fractions 1 to 4 to the BC WSQG is considered to be a conservative screening of the potentially mobile, and therefore potentially bioavailable, sediment constituents. It would take highly unusual/aggressive reducing and oxidizing conditions, respectively, to mobilize fractions 3 and 4 and these conditions are not likely to occur in the Greenhills Creek watershed.



⁹ Including the alert concentration for selenium (see BCMOE 2014 and BCMOECCS 2021a).

(ISQG; BCMOECCS 2021b). In contrast, the upper BC WSQG are considered equivalent to or are set equal to the CCME's Probable Effects Level (CCME 2001), which represent a concentration above which effects to aquatic biota may be more frequently observed (BCMOECCS 2021b).

Regional reference area normal ranges, which represent the 2.5th and 97.5th percentiles of the reference area data for a particular constituent, were included in the plots of metal and PAH concentrations in sediments (Minnow 2020b,c). For lotic areas, regional reference area normal ranges calculated based on sediment chemistry data collected from creek habitats as part of the RAEMP (Minnow 2020b) were used. Reference area normal ranges derived as part of the Lentic Area Supporting Study (Minnow 2020c) were applied to the Greenhills Creek Sedimentation Pond (RG_GHP). Although Greenhills Creek Sedimentation Pond is not a natural or naturalized lentic area, this approach was used because the pond possesses a number of lentic characteristics (e.g., longer water retention time relative to creek habitats, areas of dense vegetation). It is also recognized that, in the Elk River watershed, the concentrations of many constituents in sediment from areas considered to be in reference condition (i.e., areas unexposed to mine-influence) are above the lower BC WSQG (Minnow 2020b,c). Consequently, the upper limits of regional reference normal ranges for both lotic and lentic areas are greater than the respective lower BC WSQG for many constituents, including selenium (Minnow 2020c; Minnow 2021b).

Differences in sediment particle sizes, TOC content, and chemistry (bulk and SEA) among biological monitoring areas were evaluated using censored regression two-way ANOVAs with factors *Area*, *Year*, and *Area x Year*. Although the censored regressions allowed and accounted for censored data (i.e., values at the LRL), constituents that had >75% censored values were excluded from the analyses. *Post hoc* contrasts were completed when the main effects (*Area* or *Year*) or interaction terms were significant, and p-values were corrected accordingly. When the *Area x Year* term was insignificant, the MOD was calculated as:

$$MOD = (EMM_{area\ 2} - EMM_{area\ 1}) / EMM_{area\ 1} \times 100\%$$

where EMM is the estimated marginal mean from the censored regression ANOVA model based on all years combined. When the *Area x Year* term was significant, the MOD was calculated using the same equation as above, but for comparisons within each year, rather than all years combined.

¹¹ The most up-to-date regional reference area normal ranges for lotic sediments were first reported in the 2020 Greenhills Operations (GHO) LAEMP report (Minnow 2021b).

Temporal differences in particle sizes, TOC content, and concentrations of metals and PAHs for bulk sediments were also evaluated using a censored regression two-way ANOVA with factors Area, Year, and Area x Year. Similar comparisons were completed for metal and calcium¹² concentrations in SEA fractions 1 to 5. When the Area x Year term was insignificant, the MOD was calculated as:

$$MOD = (EMM_{year 2} - EMM_{year 1}) / EMM_{year 1} \times 100\%$$

where EMM is the estimated marginal mean from the censored regression ANOVA model based on all areas combined. When the Area x Year term was significant, the MOD was calculated using the same equation as above, but for comparisons within each area, rather than all areas combined.

The two-way ANOVAs were restricted to the years 2019 to 2022 to standardize the sizes of bulk sediment chemistry and SEA data sets among areas and years (i.e., because sediment chemistry sampling did not commence on Gardine Creek until 2019). Within each two-way ANOVA, there is a test for interactions (i.e., between Area and Year). If the interaction is not significant, then the temporal comparisons, for example, would continue by combining data for all areas (i.e., RG GHBP, RG GAUT, RG GANF, and RG GHP in the case of bulk sediment chemistry data analysis) within a year to support the comparison among years (e.g., to compare 2022 to 2019). If a similar temporal comparison between the bulk sediment chemistry results for 2022 and 2017 was completed, the results would not be very meaningful. This is because pooled data for RG GHBP, RG GAUT, RG GANF, and RG GHP (2022) would be compared to RG GHBP and RG GHP (i.e., the biological monitoring areas on Gardine Creek were not sampled sediment chemistry in 2017).

Potential effects to sediment chemistry from antiscalant addition in Lower Greenhills Creek were evaluated by comparing differences in concentrations of constituents in bulk sediment before (2017) and after (2018 to 2022) initiation of treatment. A censored regression ANOVA with a nested design with factors BA, which denotes before versus after treatment, and Year, which is nested within BA, was used. Within the nested design, the nested Year term represents differences among years in the "after" period. If significant, post hoc tests were completed to compare each "after" year (i.e., one of 2018 to 2022) to the "before" year (i.e., 2017). For significant differences, a MOD was calculated as:

$$MOD_{after\ year} = (MCT_{after\ year} - MCT_{2017})/MCT_{2017} \times 100\%$$

¹² Calcium is a correlate for calcite (see Minnow 2021a).



where the *MCT* is the measure of central tendency or, more specifically, the EMM from the censored regression ANOVA model. If the *BA* term was significant in the absence of a year effect, the marginal means were estimated for the grouped "after" years and the MOD was calculated as:

$$MOD_{year} = (MCT_{after} - MCT_{before}) / MCT_{before} \times 100\%$$

All censored regressions were conducted in R (R Core Team 2022).

To support conclusions regarding overall sediment quality (i.e., all constituents considered together), Sediment Quality Indices (SQI) were calculated by year within each area, based on concentrations of metals and PAHs measured in bulk sediment samples. The SQI are standardized to a scale of 0 to 100 with SQI approaching zero ("0") representing relatively poor sediment quality and SQI approaching 100 representing relatively good overall sediment quality. Calculations were completed in R (R Core Team 2022) following the approach of the CCME Sediment Quality Index 1.0 (CCME 2002, 2014; see also Minnow 2020c). The SQI integrate the following qualities of guideline exceedances:

- scope (i.e., percentage of constituents that did not meet their respective guidelines [number of constituents with failed samples/total number of constituents*100]);
- frequency (percentage of samples that did not meet guidelines [number of failed samples/total number of samples*100]); and
- amplitude (i.e., normalized sum of extent above guidelines, scaled between 0 and 100).

The lower BC WSQG were used, to be more conservative in the calculation of the SQI, along with the alert concentration for selenium (BCMOECCS 2021a,b).¹³ The SQI were reviewed to support identification of biological monitoring areas where overall sediment quality has changed over time, as well as differences among sampling areas.

¹³ The ISQG from the CCME (2002) and lower BC WSQG (BCMOECCS 2021b) are equivalent for most constituents, with the exception of iron, manganese, nickel, silver, benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene, for which there are no CCME guidelines. Additionally, the selenium alert concentration is unique to the BC WSQG.

A3 BENTHIC INVERTEBRATE COMMUNITY

A3.1 Overview

Benthic invertebrates are a key component of the aquatic ecosystem of the Elk River watershed. In addition to having intrinsic value, benthic invertebrate communities can be used as indicators of localized food availability (i.e., based on abundance or densities and biomass) and habitat quality (i.e., based on richness, as well as proportions and relative abundances of major taxonomic groups) for receptors at higher trophic levels.

Benthic invertebrate community samples were collected to address study questions related to community structure and productivity. Consistent with other LAEMPs and the RAEMP, benthic invertebrate community sampling was completed in September 2022.

A3.1.1 Field Sampling

A3.1.1.1 Greenhills and Gardine Creeks

Area-based kick sampling was completed at six stations per biological monitoring area to support estimations of benthic invertebrate densities and productivity (biomass), which are considered general indicators of food availability for westslope cutthroat trout (WCT; Oncorhynchus clarkii lewisi). Each of the area-based benthic invertebrate community samples was collected by kick sampling an area of approximately 1/3 square metres (m²) into a 400 µm mesh net with a triangular aperture measuring 36 cm per side. This is a modification of the Canadian Aquatic Biomonitoring Network (CABIN) technique wherein a defined area is sampled rather than sampling for a predetermined period of time. Other methods of area-based sampling, such as Hess or Surber sampling, cannot be completed effectively in Greenhills Creek (and parts of Gardine Creek) due to the calcification of the substrates. During sampling, the net was held immediately downstream of the sampler's feet so that all detritus and invertebrates disturbed from the substrate were passively collected in the kick-net by the stream current. After sampling, the kick-net was rinsed with water to move all debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed, and the contents were rinsed into a labelled plastic jar with both external and internal station identification labels. Samples were preserved to a level of 10% buffered formalin in ambient water.

In addition to the area-based kick sampling, three-minute CABIN kick (i.e., timed kick) sampling was completed at RG_GHNF and RG_GHDT (three stations each) on Upper Greenhills Creek to support comparisons to reference area normal ranges and,

in the case of RG GHNF, the assessment of biological triggers for %EPT (see Section 2.4.3) and Appendix G of the main report). 14 The timed kick sampling on Upper Greenhills Creek was completed using methods consistent with CABIN protocols (Environment Canada 2012a) and the RAEMP (Minnow 2021c). However, the field crew noted that no true riffle habitat was present at RG GHNF at the time of the 2022 sampling due to the presence of barrage tufa that blocked flow and formed cascades and calcite terraces. Larger areas of riffle-like habitat were identified at RG GHDT relative to RG GHNF; however, substrates in these areas were predominantly calcified (see Section 3.2.1 of the main report). Regardless, travelling timed kicks were completed using a net with a triangular aperture of 36 cm per side and a 400 µm mesh. During sampling, the field crew member moved across the stream channel (from bank to bank, depending on the width and depth of the creek and the presence of hazards/calcite terraces) in an upstream direction. The net was held immediately downstream of the sampler's feet so that detritus and invertebrates were passively collected in the kick-net. After sampling, the kick-net was rinsed to move all debris and invertebrates into the collection cup at the bottom of the net. The collection cup was removed, and the contents were rinsed into a labelled plastic jar with both external and internal station identification labels. Samples were preserved to a level of 10% buffered formalin in ambient water.

Supporting habitat information consistent with CABIN sampling (e.g., water velocity and depth, *in situ* water quality [temperature, DO, pH, and specific conductance], canopy cover) was collected concurrent with, and at the same locations as, benthic invertebrate community samples. As described in Section A2.2.1, CI and CI' measurements were made on a total of 50 undisturbed pebbles in the immediate vicinity of each area-based benthic invertebrate community sampling station on Greenhills and Gardine creeks (i.e., for a total of 300 pebbles per biological monitoring area).

A3.1.1.2 Greenhills Creek Sedimentation Pond

Benthic invertebrate community sampling in Greenhills Creek Sedimentation Pond was completed using a stainless-steel Petite Ponar grab sampler deployed from a boat. A single sample, consisting of a composite of five Petite Ponar grabs (i.e., a total sampling area of 0.116 m²), were collected at each station. Care was taken so that each grab captured the surface material and was full to each edge. Any incomplete grabs were discarded. Each acceptable grab was then field-sieved using a 500 µm mesh sieve bag.

¹⁴ For Lower Greenhills Creek, the assessment of biological triggers for %EPT relied on data collected from RG_GHCKD (Greenhills Creek downstream of sediment pond) as part of the annual RAEMP sampling (three stations; Minnow 2021c, 2022a). This is consistent with the approach for Lower Greenhills Creek in 2020 and 2021 (Minnow 2021a, 2022b).

After five acceptable grabs were added to the sieve bag and fully sieved free of debris smaller than 500 μ m, the retained material was transferred into one or more plastic sampling jar(s) containing both external and internal station identification labels. Benthic invertebrate community samples were preserved to a level of 10% buffered formalin in ambient water.

Supporting habitat information (e.g., water depth and *in situ* water quality [temperature, DO, pH, and specific conductance]) were collected concurrent with, and at the same locations as, each benthic invertebrate community sample.

A3.1.2 Laboratory Analysis

Area-based benthic invertebrate community samples were sent to ZEAS Inc. (ZEAS) in Nobleton, Ontario for analysis. At the laboratory, preserved organisms in each sample were sorted from the sample debris and identified to the lowest practical level (LPL) of taxonomy (typically genus or species) using methods described by Environment Canada (2014). Organisms were then grouped at the family level of taxonomy for weighing (i.e., preserved wet weight biomass). Each family group of organisms were gently placed onto a fine cloth or paper towel to drain excess surface moisture (water and preservative) before being weighed to the nearest 0.1 milligram (mg). Total and family-level biomass and the density of each taxon were reported for each of the area-based samples. Laboratory QA/QC procedures included assessments of sub-sampling accuracy and precision, as well as percent organism recovery (see Appendix B of the main report).

Timed kick samples were sent to Cordillera Consulting (Cordillera) in Summerland, BC for sorting and taxonomic identification. Organisms were identified to the LPL of taxonomy (typically genus or species). At the beginning of the sorting process, each sample was examined and evaluated to estimate the total invertebrate number. If the total number was estimated to be >600, then the laboratory's subsampling protocol was followed. The whole sample was processed for samples estimated to have <600 individuals. Samples were sorted using methods consistent with those described by Environment Canada (2014) and CABIN requirements (i.e., a minimum of 5% of each sample was sorted and at least 300 organisms were counted in every sample). Sorting efficiency and sub-sampling accuracy and precision were quantified using methods specified by Environment Canada (2012b, 2014; see also Appendix B).

A3.1.3 Data Analysis

Data for area-based samples collected from Greenhills Creek, Gardine Creek, and the Greenhills Creek Sedimentation Pond were summarized by calculating the following endpoints:



- density (number of organisms per square metre [no./m²]);
- biomass (grams per square metre [g/m²]);
- LPL richness and family richness; and
- the density and/or proportions of major taxa (i.e., EPT combined, as well as Ephemeroptera, Plecoptera, Trichoptera, and Diptera).

Total abundance, LPL richness, family richness, and abundances and/or proportions of **EPT** well major taxa (i.e., combined, as as Ephemeroptera, Plecoptera, Trichoptera, and Diptera) were calculated for the timed kick samples collected from Upper Greenhills Creek (RG GHNF and RG GHDT). These endpoints were also calculated for the RAEMP monitoring area (RG GHCKD) on Lower Greenhills Creek to support interpretation of biological data for RG GHBP, comparisons to reference area normal ranges, and the biological trigger evaluation for %EPT (see below). However, the RAEMP report will be the main venue for reporting and interpreting data for RG GHCKD.

Differences in benthic invertebrate community endpoints among areas and years were evaluated based on area-based samples using an ANOVA with factors Area and Year and Area x Year. The best transformation was chosen (i.e., log₁₀, rank, or untransformed) for which a Shapiro-Wilk's test on the residuals gives the highest p-value. Appropriate post hoc contrasts were completed when the main effects (Area or Year) or interaction terms were significant ($\alpha = 0.1$) based on p-values corrected for the number of comparisons. For significant, post hoc comparisons among years, the MOD was calculated in standard deviations (SD) of the reference year as:

$$\frac{MCT_{year} - MCT_{2016}}{SD_{2016}}$$

where MCT_{year} is the MCT for a given year after 2016¹⁵ and MCT_{2016} is the MCT in 2016. Similarly, the MODs between areas with significant post hoc comparisons were calculated as:

$$\frac{MCT_{untreated} - MCT_{RG_GHBP}}{SD_{RG_GHBP}}$$

Where MCT_{untreated} is the MCT for a given biological monitoring area that was not treated with antiscalant in the years and months leading up to September 2022 and MCTRG GHBP is the MCT for the treated (i.e., from October 2017 to August 2022) area on Lower Greenhills Creek.

¹⁵ The first year of baseline benthic invertebrate community monitoring for Greenhills Creek.

Differences in benthic community endpoints that could potentially be attributed to antiscalant addition on Lower Greenhills Creek were evaluated using a BACI design (Green 1979). An ANOVA model was used to fit the data for each area from pre- and post-application of antiscalant as follows:

$$Y = CI + BA + BA \times CI + Area(CI) + Year(BA) + Year(BA) \times CI + Area(CI) \times BA + Area(CI) \times Year(BA) + \epsilon$$

where:

- *Y* = response variable;
- *CI* = a fixed factor for area type with two levels (use of antiscalant; no use of antiscalant);
- BA = a fixed factor with two levels: before (2016 and 2017) and after (2018 to 2022) use of antiscalant;
- BA × CI = the interaction between BA and CI with a significant effect suggesting the difference between pre-antiscalant and post-antiscalant varies among areas where the antiscalant was applied;
- Area(CI) = a fixed factor for area (nested in CI because each area can only be assigned to one level of CI);
- Year(BA) = a fixed categorical factor for year (nested in BA because each year can only be assigned to one level of BA);
- $CI \times Year(BA)$ = the interaction between CI and Year;
- $BA \times Area(CI)$ = the interaction between BA and Area;
- $Area(CI) \times Year(BA)$ = the interaction between Area and Year; and
- ϵ = the error term.

The BACI effects were assessed by testing the significance of the interaction terms containing the *BA* and *CI* terms. A p-value of 0.1 was used to test the significance of the interaction terms.

Interpretation of the ANOVA table began by assessing the significance of the interaction between Area(CI) and Year(BA). If the interaction was significant, then the differences among areas changed over time (i.e., a BACI effect), although this was dependent on which years and areas were compared. *Post hoc* contrasts were conducted, as appropriate, to determine the areas and years with significant differences.

If the full interaction term was not significant, then the interpretation of the ANOVA table continued by assessing the significance of the interaction between CI and Year(BA) and the interaction between BA and Area(CI). These terms in the model assess whether the relative difference among areas depends on which year and group (antiscalant or no antiscalant) are compared (i.e., is there a BACI effect that depends on which years are compared?) and whether a change in the differences between groups is dependent on which area and period (before or after) are compared (i.e., is there a BACI effect that depends on which areas are compared?). If these interaction terms were significant, contrasts were conducted to determine where the interaction was occurring.

If these interaction terms were not significant, the interaction between BA and CI was assessed for significance. If this interaction was significant, the relative differences between the treated and untreated areas were dependent on the time period (before or after), indicating that the treated areas were responding similarly in showing a greater or lesser difference from untreated areas in the after period compared to the before period (i.e., there is a consistent BACI effect that does not depend on which year and group are compared).

If significant differences were found, the MOD was calculated as:

$$\frac{((After\ Year_{treated}-After\ Year_{untreated})-(Before\ Year_{treated}-Before\ Year_{untreated}))}{SD}$$

where:

- After Year_{treated} After Year_{untreated} = difference between treated and untreated areas in the after treatment time period;
- Before Year_{treated} Before Year_{untreated} = difference between treated and untreated areas in the before treatment time period; and
- *SD* = the standard deviation of the residuals in the ANOVA on the transformed scale, where appropriate.

If the interaction term between *BA* and *CI* was not significant, then it was concluded that there were no BA effects that could be attributed to treatment with antiscalant.

Potential relationships between benthic invertebrate community endpoints and calcite measurements (CI, CI', and concretion scores) and water chemistry data were examined by correlation analysis. Specific endpoints included density, biomass, LPL richness, family richness, %EPT, %Ephemeroptera, %Plecoptera, %Trichoptera, and %Diptera. These endpoints were compared with co-located and concurrent calcite indices, concretion scores, and water chemistry data collected in 2022, and from 2017 to 2022

(i.e., all data combined). Water quality data for constituents with EWTs were included in the correlation analyses. Significant correlations were assessed at α = 0.05 and Bonferroni corrections were used to account for the number of independent comparisons. Correlation analyses were completed in R (R Core Team 2022).

Comparisons to regional reference area normal ranges from the RAEMP (Minnow 2020b) were completed for the timed kick samples collected from RG_GHNF and RG_GHDT on Upper Greenhills Creek and RG_GHCKD (RAEMP area) on Lower Greenhills Creek. The regional reference area normal ranges for benthic invertebrate community endpoints were calculated using all the timed kick data collected from reference areas between 2012 and 2019 and represent the 2.5th and 97.5th percentiles of the reference area data set (Minnow 2020b). Data from area-based kicks completed in 2022 were not compared to regional reference area normal ranges because the methods underlying the reference area normal ranges (i.e., three-minute CABIN) and the area-based (1/3 m²) benthic invertebrate community kicks are not comparable or compatible (Minnow 2022b).

Comparisons to the %EPT biological triggers (Teck 2018, 2021) were made for the timed kick samples, specifically those from RG GHNF on Upper Greenhills Creek (n = 3 replicates) and from RAEMP area RG GHCKD on Lower Greenhills Creek (n = 3 replicates) (see Appendix G of the main report). Data for these biological monitoring areas were paired with water quality projections from Teck's routine stations GH HWGH BRB (RG GHNF) and GH GH1 (RG GHCKD). The use of projections from GH HWGH BRB represents a deviation from the 2022 study design (Minnow 2022a). The study team planned to pair RG GHNF with projections for GH USAAS, which, like RG GHNF, is located upstream from the current AAS location on Upper Greenhills Creek. However, water quality monitoring at GH USAAS did not start until November 2022 and no projections are available for that station. Consequently, RG GHNF was paired with projections from GH HWGH BRB, which is located downstream from the AAS on Upper Greenhills Creek, consistent with the 2021 GC LAEMP report (Minnow 2022b). Similarly, RG GHCKD is on Greenhills Creek downstream from the historical (i.e., from October 2017 to August 2022) AAS operation location whereas GH GH1 is on Lower Greenhills Creek upstream from the historical AAS operation location.

A4 BENTHIC INVERTEBRATE TISSUE CHEMISTRY

A4.1 Overview

As indicated in Section A3.1, benthic invertebrates are a key component of the aquatic ecosystem of the Elk River watershed. Benthic invertebrate tissue chemistry samples were collected in 2022 to address study questions related to accumulation of selenium in benthic invertebrate tissues and to evaluate potential risks to vertebrate consumers like fish and birds. Benthic invertebrate tissue chemistry sampling was completed in February (Lower Greenhills Creek) September (Greenhills Creek, Gardine and Creek, and the Greenhills Creek Sedimentation Pond) 2022.

A4.1.1 Greenhills and Gardine Creeks

Benthic invertebrate tissue chemistry samples were collected using the kick sampling method described in Section A3.1.1.1, except that sampling was not timed or limited to 1/3 m² (i.e., kicks were completed until the desired mass of benthic invertebrate tissue was obtained). Following each kick, the contents of the net were emptied into a white plastic tub and examined visually to document the presence of annelids, which can increase variability in selenium chemistry results if included in the composite-taxa samples for tissue chemistry analyses (Golder 2021; Luoma 2021). If annelids were present in a given sample, the field crew estimated the abundance (i.e., number) of annelids in the sample as well as the proportion (%) of total invertebrate biomass represented by annelids (Golder 2021). If annelids represented less than or equal to (≤) 5% of the total invertebrate biomass in the sample, annelids were excluded from the composite-taxa tissue chemistry sample. If annelids represented >5% of the invertebrate biomass in the sample, they were included in the composite-taxa sub-sample for tissue chemistry analysis, such that the proportion of annelid biomass in the composite-taxa sub-sample was representative of annelid biomass in the parent kick sample (Golder 2021). Additionally, separate "annelid-only" tissue chemistry samples were collected and labelled appropriately to differentiate them from any tissue chemistry samples identified as containing annelids and other taxa. For all samples, tweezers were used to carefully remove organisms until a target sample mass of 1 to 2 grams (g) wet weight was obtained. Each sample for tissue chemistry analysis was photographed and the dominant taxa (in terms of biomass) within the sample was noted on the field sheet. Samples were placed into labelled scintillation vials and stored in a cooler with ice until they could be transferred to a freezer later in the day.

A4.1.2 Greenhills Creek Sedimentation Pond

Three composite-taxa benthic invertebrate tissue chemistry samples were collected from depositional areas within Greenhills Creek Sedimentation Pond (RG_GHP). Each of the three samples correspond with one of six benthic invertebrate community sampling locations and were collected using the same methods described in Section A3.1.1.2. Each benthic invertebrate tissue chemistry sample was assessed visually for the presence of annelids. If annelids were identified in the sample, sub-sampling was completed as described in Section A4.1.1 (Golder 2021). Procedures for documenting the taxonomic composition of the samples and sample storage were consistent with those described above in Section A4.1.2.

A4.1.3 Laboratory Analysis

Frozen benthic invertebrate samples were shipped on ice to TrichAnalytics Inc. (Trich), which is a CALA-accredited laboratory, in Saanichton, BC. At the laboratory, two of the three benthic invertebrate tissue samples from Greenhills Creek Sedimentation Pond were identified as being bivalve-dominated (RG_GHP-3 and RG_GHP-5) and bivalves were confirmed as the only taxon in the third sample (RG_GHP-6). Because the high calcium content of the bivalves' shells could significantly impact the analytical results for multiple constituents (e.g., strontium, barium, lead, and possibly selenium), the samples from stations RG_GHP-3 and RG_GHP-5 were split into "bivalve-only" and "all other taxa" sub-samples prior to analysis, consistent with the protocol followed in 2021 (Minnow 2022b). Each of the samples/sub-samples collected in February and September 2022 were dehydrated (<60°C) and then analyzed for metal concentrations using laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS). Results were reported on a dry weight basis along with moisture content.

Laboratory QA/QC procedures employed by Trich included assessments of sensitivity (i.e., evaluation of LRLs), accuracy (i.e., recoveries of certified reference material), and precision (laboratory duplicates) (see Appendix B of the main report).

A4.1.4 Data Analysis

Selenium concentrations in composite-taxa benthic invertebrate tissue chemistry samples collected in September were compared using ANOVA with factors *Area* and *Year* and *Area x Year*, as described in Section A3.1.3. However, if the main effect term was significant (p-value <0.05), and subsequent *post hoc* contrasts were also significant, the MODs were expressed as a percent difference from the base year or area, rather than in standard deviations. More specifically, the MODs for comparisons over time and among areas were calculated as:

$$MOD = (MCT_{vear 2} - MCT_{vear 1}) / MCT_{vear 1} \times 100\%$$

or

$$MOD = (MCT_{area 2} - MCT_{area 1}) / MCT_{area 1} \times 100\%$$

respectively, where the MCT is the back-transformed estimated marginal mean.

A separate comparison of tissue selenium concentrations measured in composite-taxa samples from February and September was completed for each year (i.e., 2019 to 2022; no winter sampling was completed in 2018) to determine if tissue concentrations differ in fall (September) versus winter (February). An ANOVA with factors Area, Year, Month, and their interactions was used. If the main effect term was significant (p-value <0.05), and subsequent post hoc contrasts were also significant, the MODs were expressed as a percent difference from February of a given year. More specifically, the MODs for the comparisons were calculated as:

$$MOD = (MCT_{February} - MCT_{September}) / MCT_{February} \times 100\%$$

where the MCT is the measure of central tendency (i.e., the back-transformed EMM).

Concentrations of selenium in composite-taxa benthic invertebrate tissue chemistry samples collected from lotic habitats in 2022 were compared to prediction intervals generated from the regional lotic bioaccumulation model (Golder 2020) and total aqueous selenium concentrations measured in samples collected concurrent with tissue sample collection. The bioaccumulation model is as follows:

$$log_{10}[Se]_{benthic\ invertebrate} = 0.720 + 0.071 \times log_{10}[Se]_{aqueous}$$

The observed selenium concentrations in benthic invertebrate tissue samples collected from lotic habitats were compared to predicted results from the bioaccumulation model, as well as their 95% prediction intervals. If observed concentrations were higher than the upper prediction interval limits, tissue concentrations were considered higher than expected.

Biological triggers developed for selenium concentrations in benthic invertebrate tissues, as part of Teck's AMP (Teck 2018, 2021), were applied to RG GHNF on Upper Greenhills Creek and RG GHBP on Lower Greenhills Creek (see Appendix G of the main report). Biological monitoring areas RG_GHNF and RG_GHBP are in proximity to routine water quality monitoring locations with water quality projections (i.e., GH HWGH BRB¹⁶ and

¹⁶ As discussed in Section A3.1.3, the use of projections for GH_HWGH_BRB instead of GH_USAAS represents a deviation from the 2022 study design (Minnow 2022a). However, the use of projections for GH HWGH BRB is considered acceptable for 2022, given that the AAS was not operational on Upper Greenhills Creek until November 2022.



GH_GH1, respectively). These biological monitoring areas were also included in the assessment of biological triggers for 2020 (RG_GHBP) and 2021 (RG_GHNF and RG_GHBP; Minnow 2021a, 2022b). Historically, interpretation of biological triggers for RG_GHBP was completed in consideration of the fact that GH_GH1 was upstream from the AAS and RG_GHBP was downstream from the AAS. This will be the case again for 2022, given that the AAS ceased to operate on Lower Greenhills Creek less than a month prior to the September sampling program.

Selenium concentrations in composite-taxa benthic invertebrate tissue samples were also interpreted in consideration of site-specific aqueous selenium speciation and sulphate data (see Section A1) and compared to regional reference area normal ranges, EVWQP Benchmarks, and relevant effect concentrations. Selenium concentrations in benthic invertebrate tissues collected from lotic habitats and the Greenhills Creek Sedimentation Pond in 2022 were compared to outputs (predictions) of the selenium speciation bioaccumulation tool (B-tool; de Bruyn and Luoma 2021). The B-tool relies on aqueous selenium speciation and sulphate concentration data and is meant to support improved understanding of the relationship between aqueous selenium speciation and selenium concentrations in benthic invertebrate tissues. Comparisons to EVWQP Benchmarks included the Level 1, 2, and 3 Benchmarks for effects to growth, reproduction, and survival of benthic invertebrates, and dietary effects to juvenile fish and birds (Golder 2014). Comparisons to the ENV/BCMOECCS interim guideline (i.e., 4 milligrams per kilogram dry weight [mg/kg dw]) were not made because the EVWQP Benchmarks are considered more site-specific and therefore more relevant (BCMOE 2014; Golder 2014).

¹⁸ The GC LAEMP study design submitted in August 2022 indicated that a 45 mg/kg dw preliminary benchmark for maternal amphibian diet would also be used (Massé et al. 2015). Given that this preliminary benchmark does not represent the current state of the science (Golder 2022a) and amphibian habitat is limited within the study area, this comparison was excluded from the 2022 report.



¹⁷ However, the site-specific EVWQP Level 1 Benchmark for dietary effects to growth of juvenile fish (i.e., 11 mg/kg dw) is not applicable to juvenile WCT and WCT are the only fish species known to occur in Greenhills and Gardine Creeks (Teck 2014).

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APPENDIX B DATA QUALITY REVIEW

DATA QUALITY REVIEW APPENDIX B

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B1 INTRODUCTION

B1.1 Background

A variety of factors can influence the physical, chemical, and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are among potential factors that can lead to the reporting of data that do not accurately reflect environmental conditions. Depending on their magnitude, inaccuracy or imprecision have the potential to affect the reliability of any conclusions made from the data. Therefore, it is important to confirm that monitoring programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment).

Data quality, as a concept, is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted to establish a relevant basis for judging whether the data set is adequate. A Data Quality Review (DQR) involves comparisons of field and laboratory measurement performance to Data Quality Objectives (DQOs) established for a particular study, such as evaluation of Laboratory Reporting Limits (LRLs), blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike [MS] recoveries and/or analysis of standards or certified reference materials [CRM]).

Chemistry analyses were completed by laboratories accredited by the Canadian Association for Laboratory Accreditation (CALA) or the United States National Environmental Laboratory Accreditation Program (NELAP). The DQOs for the project were set equal to the laboratory DQOs to reflect reasonable and achievable performance expectations (Appendix Table B.1). Programs involving many samples and constituents usually have some results that exceed the DQOs. This is particularly so for multi-parameter scans (e.g., scans for metals¹) because the analytical conditions are not necessarily optimal for every element included in the scan.

A DQR was completed for all laboratory data reported in support of the 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP). The objective of the DQR was to define the overall quality of the data presented in the annual report, and, by extension,

¹ For ease of presentation, metals, metalloids, and non-metals typically included in a multi-parameter scan are collectively referred to as "metals" throughout this DQR.

Table B.1: Data Quality Objectives for the Greenhills Creek Aquatic Effects Assessment and Monitoring Program, 2022

				Study Component			
Quality Control	QC Sampl	e Type/Check	Water Chemistry	Selenium Speciation	Sediment Chemistry		
Measure			ALS	Brooks	ALS		
Analytical LRL		ctual LRL versus get LRL	LRL for each parameter should be at least as low as applicable guidelines, benchmarks, and/or effect concentrations (ideally ≤1/10th of the value)	LRL for each parameter should be at least as low as applicable guidelines, benchmarks, and effect concentrations	LRL for each parameter should be at least as low as applicable guidelines or the alert concentration for selenium (ideally ≤1/10th of the value)		
Blank Analysis	Field or La	boratory Blank	Concentrations measured in blank samples should be <lrl <sup="">a</lrl>	Concentrations measured in blank samples should be <lrl <sup="">a</lrl>	Concentrations measured in blank samples should be <lrl <sup="">a</lrl>		
	Repeatability of Reference Material Recoveries		No DQO set		No DQO set		
			Difference ≤2-times the LRL	≤20% RPD (total selenium) ≤25% RPD (selenium species)	Difference ≤2-times the LRL		
Laboratory Precision			≤4% RPD (pH) ≤10% RPD (conductivity) ≤20% RPD (all remaining constituents)	220% Tu B (coloniam species)	≤5% RPD (pH) ≤20% RPD (moisture, total and inorganic carbon) ≤30% RPD (all other metals) ≤40% RPD (aluminum, barium, lead, mercury, molybdenum, potassium, strontium, titanium) ≤50% RPD (PAHs)		
	Repeatability of Reference Material Recoveries		-	-	-		
	Taxonomic Precision		Taxonomic Precision		-	-	-
		Sub-Sampling ecision	-	-	-		
	Spike/Labo	Recovery of Blank Spike/Laboratory Control Sample 60 to 140% (total and dissolved silicon) 75 to 125% (TKN) 80 to 120% (all remaining constituents) 85 to 115% (TSS, TDS, turbidity, alkalinity, ammonia, bromide) 90 to 110% (conductivity, chloride, fluoride, nitrate, nitrite, sulphate) 98.6 to 101% (pH)		75 to 125% recovery (methylseleninic acid, selenate, selenite, selenocyanate, selenomethionine, total selenium)	50 to 130% (naphthalene) 60 to 130% (PAHs) 70 to 130% (leachable metals) 80 to 120% (bulk metals) 90 to 110% (moisture, total and inorganic carbon) 97-103% (pH)		
	Recovery o	of Matrix Spike	70 to 130% (all remaining constituents) 75 to 125% (ammonia, bromide, chloride, fluoride, nitrate, nitrite, sulphate)	75 to 125% recovery (selenate, selenite, selenocyanate, selenomethionine, total selenium)	50 to 140% (PAHs)		
Accuracy	Matrix Spike Duplicate Recovery of Certified Reference Material, QC Standards		-	75 to 125% recovery (selenate, selenite, selenocyanate, selenomethionine, total selenium) ≤20% RPD (total selenium) ≤25% RPD (selenate, selenite, selenocyanate, selenomethionine)	-		
			-	75 to 125% (total selenium)	40 to 160% (boron, thallium) 70 to 130% (remaining metals) ^b 80 to 120% (total and inorganic carbon) 96 to 104% (pH)		
	Organis	m Recovery	-	-	-		
	Organism	Sub-Sampling curacy	-	-	-		

Notes: QC = quality control; ALS = ALS Environmental; Brooks = Brooks Applied Laboratory; Trich = TrichAnalytics Inc.; Cordillera = Cordillera Consulting; ZEAS = ZEAS Inc.; LRL = Laboratory Reporting Limit; ≤ = less than or equal to; - = not applicable; < = less than; DQO = Data Quality Objective; % = percent; RPD = relative percent difference; > = greater than; PAHs = polycyclic aromatic hydrocarbons; TKN = total Kjeldahl nitrogen; TSS = total suspended solids; TDS = total dissolved solids; CABIN = Canadian Aquatic Biomonitoring Network.

^a Only applies to QC samples at concentrations <LRL or >5-times the LRL.

b However, for multi-element scans, <10% of constituents may exceed the quoted limit by <10% before the laboratory considers the results as having not met DQO

Table B.1: Data Quality Objectives for the Greenhills Creek Aquatic Effects Assessment and Monitoring Program, 2022

0			Study Component	1
Quality Control	QC Sample Type/Check	Benthic Invertebrate Chemistry		orate Community
Measure		Trich	Cordillera	ZEAS
Analytical LRL	Compare actual LRL versus target LRL	LRL for each parameter should be at least as low as applicable guidelines, benchmarks, and effect concentrations	-	-
Blank Analysis	Field or Laboratory Blank	-	-	-
	Concentrations <4-times the LRL: Concentrations 4 to 10-times the LRL: Duplicates	No DQO set	-	-
Laboratory Precision	Concentrations >10-times the LRL:	(all remaining constituents) ≤60% RPD (calcium, strontium)		
ı	Repeatability of Reference Material Recoveries	≤20% RPD	-	-
	Taxonomic Precision	-	≤5% (identification error rate, differences in enumeration and taxonomic disagreement)	-
	Organism Sub-Sampling Precision	-	≤20% difference between sub-samples; minimum of 5% of each sample must be analyzed	≤20% difference between sub-samples; minimum of 5% of each sample must be analyzed
	Recovery of Blank Spike/Laboratory Control Sample	-	-	-
	Recovery of Matrix Spike	-	-	-
Accuracy	Matrix Spike Duplicate	-	-	-
	Recovery of Certified Reference Material, QC Standards	60 to 140% (antimony, barium, boron, silver, tin, titanium) 70 to 130% (all other constituents) 90 to 110% (selenium)	-	-
	Organism Recovery	-	≥95% recovery (CABIN)	≥90% recovery
	Organism Sub-Sampling Accuracy	-	≤20% difference between total organism counts from sub-samples and actual total organism count in whole sample	≤20% difference between density estimates from sub-samples and actual density in whole sample

Notes: QC = quality control; ALS = ALS Environmental; Brooks = Brooks Applied Laboratory; Trich = TrichAnalytics Inc.; Cordillera = Cordillera Consulting; ZEAS = ZEAS Inc.; LRL = Laboratory Reporting Limit; ≤ = less than or equal to; - = not applicable; < = less than; DQO = Data Quality Objective; % = percent; RPD = relative percent difference; > = greater than; PAHs = polycyclic aromatic hydrocarbons; TKN = total Kjeldahl nitrogen; TSS = total suspended solids; TDS = total dissolved solids; CABIN = Canadian Aquatic Biomonitoring Network.

^a Only applies to QC samples at concentrations <LRL or >5-times the LRL.

b However, for multi-element scans, <10% of constituents may exceed the quoted limit by <10% before the laboratory considers the results as having not met DQO

the confidence with which that data can be used to derive conclusions. The intent of the DQR is not to reject measurements that did not meet the DQO, but to confirm that questionable data received more scrutiny to determine what effects, if any, were had on interpretation of results within the context of the monitoring program.

B1.2 Laboratory Reporting Limits

An LRL is the lowest concentration of a constituent that can be reported with a reasonable degree of accuracy and precision and is ideally synonymous with the lower limit of quantitation (LLOQ). The LLOQ is the lowest concentration of a constituent that can be reliably measured within specific limits of precision and accuracy during routine operating conditions, as opposed to being detected which, in most cases, is the lowest concentration on the calibration curve. The LRL is typically three to ten times the method detection limit (MDL). However, to facilitate comparisons to environmental quality guidelines (e.g., for water, sediment, or tissue), particularly those that are low (i.e., near the MDL), the LRL is equal to the MDL to report the guideline. Achieving satisfactory LRLs is important when comparing concentrations to guidelines for that medium. If the LRL is above the guideline, the data cannot be accurately interpreted. Consistency is also important for LRLs when taking consecutive samples. Changes in LRLs between laboratory reports can affect summary calculations and also introduce confounding factors when assessing trends. For the 2022 GC LAEMP report, LRLs were screened against guidelines for the protection of freshwater aguatic life, Elk Valley Water Quality Plan (EVWQP) benchmarks, updated effect concentrations (EC), and other site-specific benchmarks, as appropriate.

B1.3 Quality Control Samples

Typically, a DQR involves the examination of analytical results associated with several types of Quality Control (QC) samples that are collected (or prepared) in the field and laboratory. Quality control samples collected for the GC LAEMP in 2022, and a description of each QC sample type, are as follows:

- Blanks are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed in the same way as regular samples. These samples reflect contamination of samples occurring in the field (in the case of field or trip blanks) or in the laboratory (in the case of laboratory or method blanks). Concentrations of constituents should be less than the LRL.
- Field Duplicates are samples collected from a randomly selected field station that are homogenized to the extent possible, split, and analyzed separately in the laboratory.
 The duplicate samples are handled and analyzed in an identical manner in

the laboratory. These samples reflect variability introduced during the handling of field samples (e.g., during homogenization), both in the field and laboratory, and therefore provide a measure of field sampling and laboratory precision.

- Laboratory Duplicates are replicate sub-samples created in the laboratory from randomly selected field samples that are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.
- Spike Recovery Samples are created in the laboratory by adding a known amount/concentration of a given constituent (or mixture of constituents) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amount (total amount in spiked sample minus amount in original sample) relative to the known spike amount (as a percentage). Two types of spike recovery samples are commonly analyzed. Spiked blanks are created using laboratory control materials, whereas MS are created using field-collected samples. The analysis of spiked samples provides an indication of the accuracy of analytical results.
- CRM are commercially prepared (or commercially homogenized) samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results to provide a measure of analytical accuracy. The results are reported as the percent of the known concentration that was recovered in the analysis.

B1.4 Other Quality Control Checks

Three additional types of QC checks were completed for the benthic invertebrate community samples collected as part of the 2022 GC LAEMP. These included:

Sub-sampling Error, which is assessed whenever benthic invertebrate community samples require sub-sampling (due to excessive sample volume and/or invertebrate density). By comparing the numbers of benthic invertebrates recovered from at least two sub-samples, this measure provides an evaluation of how effective the sub-sampling method was in evenly dividing the original sample. Therefore, sub-sampling error provides a measure of analytical accuracy and precision.

- Organism Recovery Checks that involve the re-processing of previously sorted material from a randomly-selected benthic invertebrate community sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is completed by an analyst who was not involved during the original processing to reduce bias. This check allows for the determination of accuracy through assessment of recovery efficiency.
- Taxonomic Error is assessed to provide an estimate of overall taxonomic precision.
 A minimum of 10 percent (%) of samples undergo re-identification and re-enumeration by someone other than the original taxonomist. This second taxonomist will document errors related to misidentification, incorrect enumeration, and/or questionable/insufficient taxonomic resolution and calculate an overall identification error rate.

B2 WATER CHEMISTRY

B2.1 Laboratory Reporting Limits

The analytical reports from ALS Environmental (ALS) for 2022 (Appendix C) were examined to provide an inventory of constituents for which the sample results were equal to or less than the target LRL (Appendix Table B.2). The LRLs for these constituents were also assessed relative to the approved and working British Columbia Water Quality Guidelines (BC WQG) for the protection of freshwater aquatic life (BCMOECCS 2021a,b; BCMWLRS 2023), the Canadian Council of Ministers of the Environment (CCME) mercury guidelines for the protection of freshwater aquatic life (CCME 2003), EVWQP Level 1 benchmarks, updated EC, and the proposed benchmark for nickel (Appendix Table B.2).² The CCME guidelines for mercury were used in lieu of the BC WQG because mercury inputs (total and methyl) in the Elk River watershed are not related to mine activities (Azimuth 2019) and Teck Coal Limited (Teck) received approval to use the CCME guideline from the British Columbia Ministry of Environment and Climate Change Strategy (ENV/BCMOECCS) on January 17, 2022.

Multiple constituents were consistently (i.e., in 100% of samples) reported at concentrations less than the LRL in 2022, including:

- bromide;
- total beryllium, bismuth, mercury, silver, and tin; and
- dissolved beryllium, bismuth, cobalt, iron, lead, mercury, silver, tin, titanium, and vanadium (Appendix Table B.2).

Additionally, the LRLs achieved for all water chemistry constituents were lower than applicable BC WQG, CCME guidelines for mercury, EVWQP Level 1 benchmarks, updated EC, and the proposed benchmark for nickel (Appendix Table B.2). Overall, the achieved LRLs were appropriate for this study.

B2.2 Field, Trip, and Laboratory Blanks

A total of two field blank samples and two trip blank samples were used to assess field sampling contamination in 2022 (Appendix Table B.3). The constituents measured in the blanks were not consistent among samples (e.g., in February 2022, concentrations of total metals were not measured in the trip blank due to bottle breakage/bottles being lost in transit);

² There are BC WQG and updated EC for nitrate and sulphate; comparisons were made to the updated EC because these are considered more relevant and site-specific than the BC WQG.

Table B.2: Laboratory Reporting Limit (LRL) Evaluation for Water Chemistry Analyses, 2022^a

Constituent	Units	BC WQG/ CCN	IE WQG ^b	Teck Screening Value/ Benchmark/	Ra	inge of LRLs ^d	No. Sample F	Results <lrl <sup="">e</lrl>
Constituent	Units	Long-term Average	Short-term Maximum	Updated Effect Concentrations ^c	February	September	February	September
Physical Tests								
Specific Conductance	μS/cm	-	-	-	2.0	2.0	0	0
Hardness (as CaCO ₃)	mg/L	-	-	-	0.50	0.50	0	0
рН	pН	6.5 to 9	0.0	-	0.10	0.10	0	0
Total Suspended Solids	mg/L	-	-	-	1.0	1.0	1 (50%)	0
Total Dissolved Solids	mg/L	-	-	1,000	20	20 to 40	0	0
Turbidity	NTU	=	-	-	0.10	0.10	0	0
Anions and Nutrients	_						•	
Alkalinity, Total (as CaCO ₃)	mg/L	>20	-	-	1.0	1.0	0	0
Ammonia, Total (as N) ^f	mg/L	0.75 to 1.9	3.9 to 13	-	0.0050	0.0050	0	5 (50%)
Bromide	mg/L	-	-	_	0.25	0.050 to 0.25	2 (100%)	10 (100%)
Chloride	mg/L	150	600	_	0.50	0.10 to 0.50	0	0
Fluoride ^g	mg/L	-	1.7 to 1.9	_	0.10	0.020 to 0.10	0	3 (30%)
Nitrate (as N)	mg/L	3.0	33	10 to 36	0.025	0.0050 to 0.0250	0	0
Nitrite (as N) h	mg/L	0.020 to 0.040	0.060 to 0.12	-	0.0050	0.0030 to 0.0250	0	6 (60%)
Total Kjeldahl Nitrogen	mg/L	-	-		0.050	0.050 to 0.50	0	4 (40%)
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	0.050	0.050 to 0.50	0	5 (50%)
, ,		-				0.0010		-
Total Phosphorus	mg/L	-	-	- 047	0.0020		0	0
Sulphate (SO ₄) ^g	mg/L	429	-	617	1.5	0.30 to 1.5	0	0
Organic/Inorganic Carbon	1			I		1	1 -	1
Total Organic Carbon	mg/L	-	-	-	0.50	0.50	0	0
Dissolved Organic Carbon	mg/L	-	-	-	0.50	0.50	0	0
Total Metals	_							
Aluminum (AI) ⁱ	mg/L	0.12 to 0.23	-	-	0.0030	0.0030 to 0.0060	0	0
Antimony (Sb)	mg/L	0.0090	-	-	0.00010	0.00010 to 0.00020	0	0
Arsenic (As)	mg/L	-	0.0050	-	0.00010	0.00010 to 0.00020	0	0
Barium (Ba)	mg/L	1.0	-	-	0.00010	0.00010 to 0.00020	0	0
Beryllium (Be)	mg/L	0.00013	-	-	0.000020	0.000020 to 0.000040	2 (100%)	10 (100%)
Bismuth (Bi)	mg/L	-	-	-	0.000050	0.000050 to 0.00010	2 (100%)	10 (100%)
Boron (B)	mg/L	1.2	-	-	0.010	0.010 to 0.020	0	4 (40%)
Cadmium (Cd)	mg/L	-	-	-	0.0000050	0.0000050 to 0.000010	0	0
Calcium (Ca)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Chromium (Cr) ^j	mg/L	0.0010	-	_	0.00010	0.00010 to 0.00020	0	1 (10%)
Cobalt (Co)	mg/L	0.0040	0.11	_	0.00010	0.00010 to 0.00020	2 (100%)	7 (70%)
Copper (Cu)	mg/L	_	-	_	0.00050	0.00050 to 0.0010	2 (100%)	6 (60%)
Iron (Fe)	mg/L	_	1.0	_	0.010	0.010 to 0.020	2 (100%)	6 (60%)
Lead (Pb) ^g	mg/L	0.013 to 0.020	0.25 to 0.42	-	0.00050	0.000050 to 0.00010	2 (100%)	7 (70%)
Lithium (Li)		-	-		0.0000	0.000030 to 0.00010	0	0
\ /	mg/L			-			0	0
Magnesium (Mg)	mg/L	- 4.7.1- 0.0	-	-	0.0050	0.0050 to 0.010	-	
Manganese (Mn)	mg/L	1.7 to 2.6	3.2 to 3.4	-	0.00010	0.00010 to 0.00020	0	0
Mercury (Hg)	mg/L	0.000026	-	-	0.00000050	0.0000050	2 (100%)	10 (100%)
Molybdenum (Mo)	mg/L	7.6	46	-	0.000050	0.000050 to 0.00010	0	0
Nickel (Ni)	mg/L	-	-	-	0.00050	0.00050 to 0.0010	0	0
Potassium (K)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Selenium (Se)	mg/L	-	-	-	0.000050	0.000050 to 0.00010	0	0
Silicon (Si)	mg/L	-	-	-	0.10	0.10 to 0.20	0	0
Silver (Ag) ^g	mg/L	0.0015	0.0030	-	0.000010	0.000010 to 0.000020	2 (100%)	10 (100%)
Sodium (Na)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Strontium (Sr)	mg/L	-	-	-	0.00020	0.00020 to 0.00040	0	0
Thallium (TI)	mg/L	0.00080	-	-	0.000010	0.000010 to 0.000020	2 (100%)	7 (70%)
Tin (Sn)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	2 (100%)	10 (100%)
Titanium (Ti)	mg/L	-	_	-	0.00030	0.00030 to 0.00060	2 (100%)	5 (50%)
Uranium (U)	mg/L	0.0085	-	_	0.000010	0.000010 to 0.000020	0	0
Vanadium (V)	mg/L	-	-	_	0.00050	0.00050 to 0.0025	2 (100%)	5 (50%)
variaululli (v)								- \ /-/

Notes: BC = British Columbia; WQG = Water Quality Guidelines; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; LRL = Laboratory Reporting Limit; No. = number; < = less than; μS/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; % = percent; NTU = Nephelometric Turbidity Units; μg/L = micrograms per litre; EC = Effect Concentration; DOC = dissolved organic carbon.

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

^c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used. For nitrate and sulphate, LRLs were evaluated relative to the updated EC, which are considered more site-specific and relevant than the BC WQG.

^a The LRLs for all constituents were consistently less than the applicable WQG, screening values, benchmarks, or updated EC.

e The total number of samples in February 2022 was n = 2 (n = 1 water sample and n = 1 duplicate sample); in September 2021, the total number of samples was n = 10 (n = 9 water samples and n = 1 duplicate sample). Data for field and trip blanks are summarized in Appendix Table B.3.

^f Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

⁹ Hardness-based guidelines, benchmarks, and/or updated EC were calculated based on the hardness of individual water samples.

^h Nitrite guidelines were calculated based on chloride concentrations in individual water samples.

¹ Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

^j Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

^k Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table B.2: Laboratory Reporting Limit (LRL) Evaluation for Water Chemistry Analyses, 2022^a

Constituent	Units	BC WQG/ CCI	ME WQG ^b	Teck Screening Value/ Benchmark/	Ra	inge of LRLs ^d	No. Sample F	Results <lrl <sup="">e</lrl>
Condition	· · · · ·	Long-term Average	Short-term Maximum	Updated Effect Concentrations ^c	February	September	February	September
Dissolved Metals								
Aluminum (Al)	mg/L	-	-	-	0.0010	0.0010 to 0.0020	2 (100%)	5 (50%)
Antimony (Sb)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	0	1 (10%)
Arsenic (As)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	0	2 (20%)
Barium (Ba)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	0	0
Beryllium (Be)	mg/L	-	-	=	0.000	0.000020 to 0.000040	2 (100%)	10 (100%)
Bismuth (Bi)	mg/L	-	-	=	0.000050	0.000050 to 0.00010	2 (100%)	10 (100%)
Boron (B)	mg/L	-	-	=	0.010	0.010 to 0.020	2 (100%)	7 (70%)
Cadmium (Cd) ^g	mg/L	0.00041 to 0.00046	0.0015 to 0.0028	0.00028 to 0.0013	0.0000	0.0000050 to 0.000010	1 (50%)	3 (30%)
Calcium (Ca)	mg/L	-	-	=	0.050	0.050 to 0.10	0	0
Chromium (Cr)	mg/L	-	-	=	0.00010	0.00010 to 0.00020	1 (50%)	9 (90%)
Cobalt (Co)	mg/L	-	-	-	0.00	0.00010 to 0.00020	2 (100%)	9 (100%)
Copper (Cu) k	mg/L	0.00070 to 0.0016	0.0041 to 0.0099	-	0.00020	0.00020 to 0.00040	2 (100%)	3 (30%)
Iron (Fe)	mg/L	-	0.35	-	0.010	0.010 to 0.020	2 (100%)	100 (100%)
Lead (Pb)	mg/L	-	-	-	0.000050	0.000050 to 0.00010	2 (100%)	100 (100%)
Lithium (Li)	mg/L	-	-	-	0.0010	0.0010 to 0.0020	0	0
Magnesium (Mg)	mg/L	-	-	-	0.0050	0.0050 to 0.010	0	0
Manganese (Mn)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	0	0
Mercury (Hg)	mg/L	-	-	-	0.0000005	0.0000050	2 (100%)	10 (100%)
Molybdenum (Mo)	mg/L	-	-	-	0.000050	0.000050 to 0.00010	0	0
Nickel (Ni)	mg/L	-	-	0.0052 to 0.0089	0.00050	0.00050 to 0.0010	0	0
Potassium (K)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Selenium (Se)	mg/L	-	-	-	0.000	0.000050 to 0.00010	0	0
Silicon (Si)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Silver (Ag)	mg/L	-	-	-	0.000010	0.000010 to 0.000020	2 (100%)	10 (100%)
Sodium (Na)	mg/L	-	-	-	0.050	0.050 to 0.10	0	0
Strontium (Sr)	mg/L	-	-	-	0.00020	0.00020 to 0.00040	0	0
Thallium (TI)	mg/L	-	-	-	0.000010	0.000010 to 0.000020	2 (100%)	8 (80%)
Tin (Sn)	mg/L	-	-	-	0.00010	0.00010 to 0.00020	2 (100%)	100 (100%)
Titanium (Ti)	mg/L	-	-	-	0.000	0.00030 to 0.00060	2 (100%)	100 (100%)
Uranium (U)	mg/L	-	-	-	0.000010	0.000010 to 0.000020	0	0
Vanadium (V)	mg/L	-	-	-	0.00050	0.00050 to 0.0010	2 (100%)	100 (100%)
Zinc (Zn)	mg/L	-	-	-	0.0010	0.0010 to 0.0020	1 (50%)	7 (70%)

Notes: BC = British Columbia; WQG = Water Quality Guidelines; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; LRL = Laboratory Reporting Limit; No. = number; < = less than; μ S/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; % = percent; NTU = Nephelometric Turbidity Units; μ g/L = micrograms per litre; EC = Effect Concentration; DOC = dissolved organic carbon.

a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

b Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used. For nitrate and sulphate, LRLs were evaluated relative to the updated EC, which are considered more site-specific and relevant than the BC WQG.

 $d \ The \ LRLs \ for \ all \ constituents \ were \ consistently \ less \ than \ the \ applicable \ WQG, \ screening \ values, \ benchmarks, \ or \ updated \ EC.$

e The total number of samples in February 2022 was n = 2 (n = 1 water sample and n = 1 duplicate sample); in September 2021, the total number of samples was n = 10 (n = 9 water samples and n = 1 duplicate sample). Data for field and trip blanks are summarized in Appendix Table B.3.

f Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

 $g \ Hardness\text{-}based \ guidelines, \ benchmarks, \ and/or \ updated \ EC \ were \ calculated \ based \ on \ the \ hardness \ of \ individual \ water \ samples.$

h Nitrite guidelines were calculated based on chloride concentrations in individual water samples.

i Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

 $j \ Guideline \ for \ chromium \ VI \ (0.001 \ mg/L) \ was \ selected \ because \ this \ is \ the \ principal \ species \ found \ in \ surface \ waters.$

k Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table B.3: Field Blank and Trip Blank Evaluation for Water Chemistry Analyses, 2022 a

		BC WQG/ CC	ME WQG ^b	Teck Screening Value/	Range	of LRLs ^d	Field Bla	nk <lrl <sup="">e</lrl>	Trip Bla	nk <lrl <sup="">e</lrl>
Constituent	Units	Long-term Average	Short-term Maximum	Benchmark/ Updated Effect Concentrations ^c	February	September	February	September	February	September
Physical Tests										
Specific Conductance	μS/cm	-	-	-	2.0	2.0	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Hardness (as CaCO ₃)	mg/L	-	=	-	0.50	0.50	1 (100%)	1 (100%)	1 (100%)	1 (100%)
рН	pН	6.5 to 9	9.0	=	0.10	0.10	0	0	0	0
Total Suspended Solids	mg/L	-	=	-	1.0	1.0	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Total Dissolved Solids	mg/L	-	=	1,000	10	10	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Turbidity	NTU	-	-	-	0.10	0.10	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Anions and Nutrients										
Alkalinity, Total (as CaCO ₃)	mg/L	>20	-	-	1.0	1.0	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Ammonia, Total (as N) ^f	mg/L	0.75 to 1.9	3.9 to 13	-	0.0050	0.0050	1 (100%)	1 (100%)	1 (100%)	0 (0%)
Bromide	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Chloride	mg/L	150	600	-	0.10	0.10	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Fluoride ^g	mg/L	-	1.7 to 1.9	-	0.020	0.020	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Nitrate (as N)	mg/L	3.0	33	10 to 36	0.0050	0.0050	1 (100%)	1 (100%)	0 (0%)	1 (100%)
Nitrite (as N) h	mg/L	0.020 to 0.040	0.060 to 0.12	-	0.0010	0.0010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Total Kjeldahl Nitrogen	mg/L	-	<u> </u>	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Orthophosphate-Dissolved (as P)	mg/L	-	-	_	0.0010	0.0010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Total Phosphorus	mg/L	-	-	-	0.0020	0.0020	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Sulphate (SO ₄) ^g	mg/L	429	_	617	0.30	0.30	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Organic/Inorganic Carbon	1 1119/2	120		011	0.00	0.00	1 (10070)	1 (10070)	1 (10070)	1 (10070)
Total Organic Carbon	mg/L	-	-		0.50	0.50	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Dissolved Organic Carbon	mg/L	_	-	_	0.50	0.50	1 (100%)	1 (100%)	- (10070)	- (10070)
Total Metals	I IIIg/L	-	<u>-</u>	<u>-</u>	0.50	0.50	1 (10070)	1 (10070)	<u>-</u>	_
Aluminum (AI) i	mg/L	0.12 to 0.23	-		0.0030	0.0030	1 (100%)	1 (100%)	_	1 (100%)
Antimony (Sb)	mg/L	0.0090		-	0.0030	0.0030	1 (100%)	1 (100%)	-	1 (100%)
* ' '		-	0.0050	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Arsenic (As)	mg/L	1.0		-			, ,	, ,	-	,
Barium (Ba)	mg/L		-	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Beryllium (Be)	mg/L	0.00013	-	-	0.000020	0.000020	1 (100%)	1 (100%)	-	1 (100%)
Bismuth (Bi)	mg/L	-	-	-	0.000050	0.000050	1 (100%)	1 (100%)	-	1 (100%)
Boron (B)	mg/L	1.2	=	-	0.010	0.010	1 (100%)	1 (100%)	-	1 (100%)
Cadmium (Cd)	mg/L	-	-	-	0.0000050	0.0000050	1 (100%)	1 (100%)	-	1 (100%)
Calcium (Ca)	mg/L	-	=	-	0.050	0.050	1 (100%)	1 (100%)	-	1 (100%)
Chromium (Cr) ^j	mg/L	0.0010	-	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Cobalt (Co)	mg/L	0.0040	0.11	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Copper (Cu)	mg/L	-	-	-	0.00050	0.00050	1 (100%)	1 (100%)	-	1 (100%)
Iron (Fe)	mg/L	-	1.0	-	0.010	0.010	1 (100%)	1 (100%)	-	1 (100%)
Lead (Pb) ^g	mg/L	0.013 to 0.020	0.25 to 0.42	-	0.000050	0.000050	1 (100%)	1 (100%)	-	1 (100%)
Lithium (Li)	mg/L	-	-	-	0.0010	0.0010	1 (100%)	1 (100%)	-	1 (100%)
Magnesium (Mg)	mg/L	-	=	-	0.0050	0.0050	1 (100%)	1 (100%)	-	1 (100%)
Manganese (Mn)	mg/L	1.7 to 2.6	3.2 to 3.4	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Mercury (Hg)	mg/L	0.000026	=	-	0.00000050	0.0000050	1 (100%)	1 (100%)	-	1 (100%)
Molybdenum (Mo)	mg/L	7.6	46	-	0.000050	0.000050	1 (100%)	1 (100%)	-	1 (100%)
Nickel (Ni)	mg/L	-	-	-	0.00050	0.00050	1 (100%)	1 (100%)	-	1 (100%)
Potassium (K)	mg/L	-	=	-	0.050	0.050	1 (100%)	1 (100%)	-	1 (100%)
Selenium (Se)	mg/L	-	=	-	0.000050	0.000050	1 (100%)	1 (100%)	-	1 (100%)
Silicon (Si)	mg/L	-	=	-	0.10	0.10	1 (100%)	1 (100%)	-	1 (100%)
Silver (Ag) ^g	mg/L	0.0015	0.0030	-	0.000010	0.000010	1 (100%)	1 (100%)	-	1 (100%)
Sodium (Na)	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	-	1 (100%)
Strontium (Sr)	mg/L	-	-	-	0.00020	0.00020	1 (100%)	1 (100%)	-	1 (100%)
Thallium (TI)	mg/L	0.00080	-	-	0.000010	0.000010	1 (100%)	1 (100%)	-	1 (100%)
Tin (Sn)	mg/L	-	-	-	0.00010	0.00010	1 (100%)	1 (100%)	-	1 (100%)
Titanium (Ti)	mg/L	-	-	-	0.00030	0.00030	1 (100%)	1 (100%)	-	1 (100%)
Uranium (U)	mg/L	0.0085	-	_	0.000010	0.000010	1 (100%)	1 (100%)	-	1 (100%)
Vanadium (V)	mg/L	-	-	-	0.00050	0.00050	1 (100%)	1 (100%)	-	1 (100%)
Zinc (Zn) ^g	mg/L	0.12 to 0.19	0.15 to 0.34	-	0.0030	0.0030	1 (100%)	1 (100%)	-	1 (100%)
۱۱۱۰ (۲۱۱ <i>)</i>	my/L	0.12 10 0.19	0.10 10 0.04		0.0000	0.0000	1 (10070)	1 (10070)	-	1 (10070)

Shading indicates blank concentrations at or greater than the LRL.

Notes: BC = British Columbia; WQG = Water Quality Guidelines; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; LRL = Laboratory Reporting Limit; No. = number; < = less than; μ S/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; % = percent; NTU = Nephelometric Turbidity Units; μ g/L = micrograms per litre; EC = Effect Concentration; DOC = dissolved organic carbon.

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used.

^d The LRLs for all constituents were consistently less than the applicable WQG, screening values, benchmarks, or updated EC.

e The total number of samples in February 2022 was n = 2 (n = 1 trip blank and n = 1 field blank). The total number of samples in September 2022 was also n = 2 (n = 1 trip blank and n = 1 field blank). Some parameters were not consistently analyzed and reported for the blank samples; differences in sample numbers are reflected in the table.

^f Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

⁹ Hardness-based guidelines, benchmarks, and/or screening values were calculated based on the hardness of individual water samples.

^h Nitrite guidelines and screening values were calculated based on chloride concentrations in individual water samples. ⁱ Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

 $^{^{\}rm j}$ Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

^k Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table B.3: Field Blank and Trip Blank Evaluation for Water Chemistry Analyses, 2022 a

		BC WQG/ CCI	ME WQG ^b	Teck Screening Value/	Range o	of LRLs ^d	No. Sample	Results <lrl< th=""><th>Trip Bla</th><th>nk <lrl <sup="">e</lrl></th></lrl<>	Trip Bla	nk <lrl <sup="">e</lrl>
Constituent	Units	Long-term Average	Short-term Maximum	Benchmark/ Updated Effect Concentrations ^c	February	September	February	September	February	September
Dissolved Metals										
Aluminum (AI)	mg/L	=	=	-	0.0010	0.0010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Antimony (Sb)	mg/L	=		-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Arsenic (As)	mg/L	=	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Barium (Ba)	mg/L	=	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Beryllium (Be)	mg/L	=	-	-	0.000020	0.000020	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Bismuth (Bi)	mg/L	=	-	-	0.000050	0.000050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Boron (B)	mg/L	=	-	-	0.010	0.010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Cadmium (Cd) ^g	mg/L	0.00041 to 0.00046	0.0015 to 0.0028	0.00028 to 0.0013	0.0000050	0.0000050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Calcium (Ca)	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Chromium (Cr)	mg/L	-	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Cobalt (Co)	mg/L	-	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Copper (Cu) k	mg/L	0.00070 to 0.0016	0.0041 to 0.0099	-	0.00020	0.00020	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Iron (Fe)	mg/L	-	0.35	-	0.010	0.010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Lead (Pb)	mg/L	-	-	-	0.000050	0.000050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Lithium (Li)	mg/L	=	=	-	0.0010	0.0010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Magnesium (Mg)	mg/L	=	-	-	0.0050	0.0050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Manganese (Mn)	mg/L	=	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Mercury (Hg)	mg/L	-	-	-	0.0000050	0.0000050	1 (100%)	1 (100%)	1 (100%)	-
Molybdenum (Mo)	mg/L	-	-	-	0.000050	0.000050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Nickel (Ni)	mg/L	-	-	0.0052 to 0.0089	0.00050	0.00050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Potassium (K)	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Selenium (Se)	mg/L	-	-	-	0.000050	0.000050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Silicon (Si)	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Silver (Ag)	mg/L	-	-	-	0.000010	0.000010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Sodium (Na)	mg/L	-	-	-	0.050	0.050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Strontium (Sr)	mg/L	-	-	-	0.00020	0.00020	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Thallium (TI)	mg/L	-	-	-	0.000010	0.000010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Tin (Sn)	mg/L	-	-	-	0.00010	0.00010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Titanium (Ti)	mg/L	-	-	-	0.00030	0.00030	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Uranium (U)	mg/L	-	-	-	0.000010	0.000010	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Vanadium (V)	mg/L	-	-	-	0.00050	0.00050	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Zinc (Zn)	mg/L	-	-	-	0.0010	0.0010	1 (100%)	1 (100%)	1 (100%)	1 (100%)

Shading indicates blank concentrations at or greater than the LRL.

Notes: BC = British Columbia; WQG = Water Quality Guidelines; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; LRL = Laboratory Reporting Limit; No. = number; < = less than; μ S/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; % = percent; NTU = Nephelometric Turbidity Units; μ g/L = micrograms per litre; Effect Concentration; DOC = dissolved organic carbon.

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

^c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used. ^d The LRLs for all constituents were consistently less than the applicable WQG, screening values, benchmarks, or updated EC.

^e The total number of samples in February 2022 was n = 2 (n = 1 trip blank and n = 1 field blank). The total number of samples in September 2022 was also n = 2 (n = 1 trip blank and n = 1 field blank). Some parameters were not consistently analyzed and reported for the blank samples; differences in sample numbers are reflected in the table.

f Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

⁹ Hardness-based guidelines, benchmarks, and/or screening values were calculated based on the hardness of individual water samples.

^h Nitrite guidelines and screening values were calculated based on chloride concentrations in individual water samples.

¹ Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023). ¹ Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

^k Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

these differences are reflected in Appendix Table B.3. The same DQOs that were used for laboratory blanks were used for field and trip blanks (Appendix Table B.1).

Of the results that were reported for field and trip blanks, only two were greater than the LRL: nitrate (as N) in one trip blank sample from February 2022 and ammonia (as N) in one trip blank sample from September 2022 (Appendix Table B.3). The detectable nitrate concentration measured in the blank sample from February was not considered reliable, given it is within five-times the LRL (Appendix Table B.1). The reported concentration of ammonia (0.0385 mg/L as N) in the trip blank from September 2022, on the other hand, was greater than five-times the LRL. However, detectable concentrations of ammonia were not reported for the field blank or five of the nine water samples collected during the September 2022 program. Additionally, anomalous ammonia detections in trip and field blanks have occurred consistently, but infrequently, over the years (e.g., Minnow 2020). Regardless, the results for the field and trip blanks indicate that, overall, contamination of the samples in the field or during transport was unlikely.

A total of 721 method blank results were reported by ALS (see Appendix C for applicable laboratory reports) and of these, one result exceeded the LRL, but was within the less than (<) 5% uncertainty range (i.e., total vanadium in September 2022 [0.0052 mg/L versus the LRL of 0.0050 mg/L]). The LRLs for the associated batch of samples were adjusted accordingly by the laboratory. Overall, the laboratory method blank results do not indicate any issues with the data that might affect data interpretability.

B2.3 Data Precision

B2.3.1 Field Duplicate Samples

Two field duplicate samples were collected to assess field sampling precision (Appendix Table B.4): one in February and one in September 2022. Samples were collected as split samples; however, the sample aliquots in the larger "general" bottles would not be considered true splits (i.e., the smaller sample bottles would have been filled from these containers, and then these containers would have been filled directly from the sampling area).

Teck does not currently have established DQO for water quality field duplicate samples. However, by conservatively evaluating paired samples relative to laboratory DQOs (Appendix Table B.1), it can be concluded that, overall, field sampling precision and reproducibility were excellent for all water quality constituents (Appendix Table B.4). This is because the small number of relative percent difference (RPD) values greater than (>) 20% (or 4 or 10% for pH and conductivity, respectively) were associated with samples that were at or near (i.e., <10-times) the detection limit and within difference limits for paired results

Table B.4: Field Duplicate Results for Water Chemistry Analyses, 2022

Constituent Physical Tests	Units	28-Fe CG22		RPD (%)		RG_GHBP September ep-22 12559	RPD (%)
Specific Conductance	μS/cm	1,600	1,610	0.62	1,540	1,530	0.65
Hardness (as CaCO ₃)	mg/L	1,070	1,080	0.02	994	1,020	2.6
pH	pH	8.26	8.28	0.93	8.33	8.35	0.24
Total Suspended Solids	mg/L	<1.0	2.4	82	2.2	1.7	26
Total Dissolved Solids	mg/L	1,400	1,430	2.1	1,400	1,400	0
Turbidity	NTU	0.48	0.40	18	1,400	1,400	19
Anions and Nutrients	INTO	0.40	0.40	10	1.02	1.54	19
Alkalinity, Total (as CaCO ₃)	mg/L	299	300	0.33	246	244	0.82
Ammonia, Total (as N)	mg/L	0.0215	0.0214	0.47	0.0084	0.0080	4.9
Bromide	mg/L	<0.250	<0.250	0.47	<0.250	<0.250	0
Chloride	mg/L	2.1	2.03	3.4	1.85	1.71	7.9
Fluoride	mg/L	0.136	0.132	3.0	0.147	0.143	2.8
Nitrate (as N)					4.34		
Nitrite (as N)	mg/L	4.81 0.0114	4.76 0.0115	1.0 0.87	0.0102	4.45 0.0094	2.5 8.2
,	mg/L	0.0114	0.0115	23	1.67	2.10	23
Total Kjeldahl Nitrogen	mg/L						0
Orthophosphate-Dissolved (as P) Total Phosphorus	mg/L	0.0026 0.0036	0.0025 0.0039	3.9 8.0	<0.0010 0.0034	<0.0010 0.0043	
<u>'</u>	mg/L						23
Sulphate (SO ₄)	mg/L	776	765	1.4	780	797	2.2
Organic/Inorganic Carbon		1.04	4.00	4.2	1.7	1.60	4.0
Total Organic Carbon	mg/L	1.84	1.92	4.3	1.7	1.62	4.8
Dissolved Organic Carbon	mg/L	1.62	1.62	0	1.86	1.68	10
Total Metals		0.0045	0.0045		0.0004	0.0004	10
Aluminum (Al)	mg/L	0.0045	0.0045	0	0.0091	0.0081	12
Antimony (Sb)	mg/L	0.00039	0.00038	2.6	0.00047	0.00048	2.1
Arsenic (As)	mg/L	0.00023	0.00023	0	0.00028	0.00029	3.5
Barium (Ba)	mg/L	0.0422	0.0424	0.47	0.0422	0.0418	1.0
Beryllium (Be)	mg/L	<0.000020	<0.000020	0	<0.000020	<0.000020	0
Bismuth (Bi)	mg/L	<0.000050	<0.000050	0	<0.000050	<0.000050	0
Boron (B)	mg/L	0.010	0.010	0	0.013	0.012	8.0
Cadmium (Cd)	mg/L	0.0000083	0.000076	8.8	0.0000142	0.0000098	37
Calcium (Ca)	mg/L	175	180	2.8	157	156	0.64
Chromium (Cr)	mg/L	0.00014	0.00014	0	0.00016	0.00011	37
Cobalt (Co)	mg/L	<0.00010	<0.00010	0	<0.00010	<0.00010	0
Copper (Cu)	mg/L	<0.00050	<0.00050	0	<0.00050	<0.00050	0
Iron (Fe)	mg/L	<0.010	<0.010	0	<0.010	<0.010	0
Lead (Pb)	mg/L	<0.000050	<0.000050	0	<0.000050	<0.000050	0
Lithium (Li)	mg/L	0.0158	0.0159	0.63	0.0197	0.0200	1.5
Magnesium (Mg)	mg/L	147	147	0	151	146	3.4
Manganese (Mn)	mg/L	0.00317	0.00314	1.0	0.00140	0.00137	2.2
Mercury (Hg)	mg/L	<0.00000050	<0.0000050	0	<0.0000050	<0.0000050	0
Molybdenum (Mo)	mg/L	0.00157	0.00160	1.9	0.00168	0.00168	0
Nickel (Ni)	mg/L	0.00803	0.00791	1.5	0.00862	0.00833	3.4
Potassium (K)	mg/L	2.35	2.35	0	2.45	2.38	2.9
Selenium (Se)	mg/L	0.145	0.145	0	0.149	0.15	0.67
Silicon (Si)	mg/L	3.93	3.91	0.51	3.54	3.60	1.7
Silver (Ag)	mg/L	<0.000010	<0.000010	0	<0.000010	<0.000010	0
Sodium (Na)	mg/L	3.16	3.07	2.9	2.72	2.66	2.2
Strontium (Sr)	mg/L	0.206	0.209	1.4	0.188	0.193	2.6
Thallium (TI)	mg/L	<0.000010	<0.000010	0	0.000024	<0.000010	82
Tin (Sn)	mg/L	<0.00010	<0.00010	0	<0.00010	<0.00010	0
Titanium (Ti)	mg/L	<0.00030	<0.00030	0	0.00036	<0.00030	18
Uranium (U)	mg/L	0.00808	0.00799	1.1	0.00864	0.00871	0.81
Vanadium (V)	mg/L	<0.00050	<0.00050	0	0.00051	<0.00050	2.0
Zinc (Zn)	mg/L	<0.0030	<0.0030	0	0.0079	<0.0030	90

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; μ S/cm = microSiemens per centimetre; CaCO $_3$ = calcium carbonate; mg/L = milligrams per litre; < = less than; NTU = Nephelometric Turbidity Units; μ g/L = micrograms per litre; LRL = Laboratory Reporting Limit.

Table B.4: Field Duplicate Results for Water Chemistry Analyses, 2022

			RG_GHBP			RG_GHBP			
O and atitude at	l lucito		February			September			
Constituent	Units	28-F	eb-22	DDD (0()	12-S	ep-22	DDD (0())		
		CG2202277		RPD (%)	CG22	12559	RPD (%)		
Dissolved Metals									
Aluminum (Al)	mg/L	<0.0010	<0.0010	0	<0.0010	<0.0010	0		
Antimony (Sb)	mg/L	0.00034	0.00034	0	0.00042	0.00046	9.1		
Arsenic (As)	mg/L	0.00016	0.00017	6.1	0.00023	0.00021	9.1		
Barium (Ba)	mg/L	0.0409	0.0413	1.0	0.0427	0.0423	0.94		
Beryllium (Be)	mg/L	<0.000020	<0.000020	0	<0.000020	<0.000020	0		
Bismuth (Bi)	mg/L	<0.000050	<0.000050	0	<0.000050	<0.000050	0		
Boron (B)	mg/L	<0.010	<0.010	0	<0.010	<0.010	0		
Cadmium (Cd)	mg/L	<0.000050	0.0000058	15	0.0000089	0.0000096	7.6		
Calcium (Ca)	mg/L	188	189	0.53	141	155	9.5		
Chromium (Cr)	mg/L	0.00013	<0.00010	26	<0.00010	<0.00010	0		
Cobalt (Co)	mg/L	<0.00010	<0.00010	0	<0.00010	<0.00010	0		
Copper (Cu)	mg/L	<0.00020	<0.00020	0	0.00042	0.00033	24		
Iron (Fe)	mg/L	<0.010	<0.010	0	<0.010	<0.010	0		
Lead (Pb)	mg/L	<0.000050	<0.000050	0	<0.000050	<0.000050	0		
Lithium (Li)	mg/L	0.015	0.0149	0.67	0.0168	0.0187	11		
Magnesium (Mg)	mg/L	147	148	0.68	156	154	1.3		
Manganese (Mn)	mg/L	0.00194	0.00188	3.1	0.0009	0.00079	13		
Mercury (Hg)	mg/L	<0.000050	<0.000050	0	<0.000050	<0.000050	0		
Molybdenum (Mo)	mg/L	0.00147	0.00152	3.3	0.00146	0.00164	12		
Nickel (Ni)	mg/L	0.0078	0.00778	0.26	0.00804	0.00818	1.7		
Potassium (K)	mg/L	2.26	2.26	0	2.38	2.33	2.1		
Selenium (Se)	mg/L	0.139	0.144	3.5	0.163	0.168	3.0		
Silicon (Si)	mg/L	3.74	3.86	3.2	3.31	3.28	0.91		
Silver (Ag)	mg/L	<0.000010	<0.000010	0	<0.000010	<0.000010	0		
Sodium (Na)	mg/L	3.02	3.05	1.0	2.55	2.54	0.39		
Strontium (Sr)	mg/L	0.213	0.214	0.47	0.171	0.191	11		
Thallium (TI)	mg/L	<0.000010	<0.000010	0	<0.000010	<0.000010	0		
Tin (Sn)	mg/L	<0.00010	<0.00010	0	<0.00010	<0.00010	0		
Titanium (Ti)	mg/L	<0.00030	<0.00030	0	<0.00030	<0.00030	0		
Uranium (U)	mg/L	0.00741	0.00732	1.2	0.00732	0.00696	5.0		
Vanadium (V)	mg/L	<0.00050	<0.00050	0	<0.00050	<0.00050	0		
Zinc (Zn)	mg/L	<0.0010	0.001	0	0.001	<0.0010	0		

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; μ S/cm = microSiemens per centimetre; CaCO $_3$ = calcium carbonate; mg/L = milligrams per litre; < = less than; NTU = Nephelometric Turbidity Units; μ g/L = micrograms per litre; LRL = Laboratory Reporting Limit.

(Appendix Tables B.1 and B.4).). Overall, the field sampling precision is considered acceptable for the purpose of this study.

B2.3.1 Laboratory Duplicate Samples

A total of 705 duplicate results were used to evaluate analytical precision (see Appendix C for relevant laboratory reports). For all paired samples, comparisons were within the DQO set by the analytical laboratory (Appendix Table B.1). The laboratory analytical precision can therefore be considered excellent.

B2.4 Data Accuracy

In 2022, data accuracy was evaluated based on results for 713 Laboratory Control Samples (LCS) and 625 MS samples (see Appendix C for respective laboratory reports). All LCS and MS results met the laboratory DQO (Appendix Table B.1). Overall, the LCS and MS results are considered indicative of excellent analytical precision.

B2.5 General Laboratory and Data Quality Flags

The multi-element scan for the water sample collected from Greenhills Creek Sedimentation Pond (RG_GHP) in September 2022 produced a dissolved selenium result (0.215 mg/L) that was 32% higher than the result for total selenium (0.156 mg/L; see laboratory report CG2213024 in Appendix C). The result for dissolved selenium may have been attributed to positive bias associated with signal enhancement from volatile selenium species. In response to these results, the study team requested ALS complete a Digested Dissolved Selenium analysis (E423ASe). The result of that analysis was a dissolved selenium concentration of 0.159 mg/L, which is only 2% higher than the total result. However, because the E423ASe digestion method is not fully approved or validated yet, the results generated using the standard multi-element scan (E420) were included in the 2022 GC LAEMP report.

B2.6 Data Quality Statement

Water quality data collected for this study are of acceptable quality as characterized by good to excellent detectability, negligible constituent concentrations in method blanks, excellent field and laboratory precision, and excellent laboratory accuracy. Therefore, the associated data can be used with a high level of confidence in the derivation of conclusions.

B3 SELENIUM SPECIATION

B3.1 Laboratory Reporting Limits

The analytical reports from Brooks Applied Labs for aqueous selenium speciation analyses were examined to provide an inventory of constituents for which the sample results were less than or equal to the target LRL (Appendix Table B.5; see Appendix C for laboratory reports). The LRLs for these constituents were also assessed relative to the approved (BCMOECCS 2021a) selenium BC WQG for the protection of freshwater aquatic life (i.e., 2 micrograms per litre [µg/L]; Appendix Table B.5).

Concentrations of selenate and selenite were consistently (i.e., in 100% of samples) greater than their applicable LRLs in 2022 (Appendix Table B.5). Dimethylselenoxide and methylseleninic acid were also detected in the two samples from February 2022 and 55 and 27%, respectively, of the aqueous selenium speciation samples collected in September 2022 (Appendix Table B.5). The LRLs were consistently lower than the BC WQG for total selenium (BCMOECCS 2021a). Therefore, the achieved LRLs were appropriate for this study.

B3.2 Laboratory Blanks

Four laboratory blank samples were analyzed in February 2022 and a total of 25 laboratory blank samples were analyzed in September 2022 (Appendix C). Each of the 161 individual constituent results that were produced met the laboratory's DQO (Appendix Table B.1). Therefore, laboratory blanks indicated no inadvertent sample contamination during analyses.

B3.3 Data Precision

B3.3.1 Field Duplicate Samples

Two field duplicate samples were collected to assess field sampling precision: one in February and one in September 2022 (Appendix Table B.6). The RPDs between paired results from February and September 2022 were less than or equal to (≤) 3.0 and ≤19%, respectively. Given that the field duplicates met the DQO for laboratory duplicate samples (Appendix Table B.1), field sampling precision and reproducibility are considered excellent.

B3.3.2 Laboratory Duplicate Samples

Analytical precision was evaluated by examining 10 laboratory duplicate samples for a total of 42 reported duplicate pairs (Appendix C). All comparisons of paired duplicate concentrations were within the DQO set by the analytical laboratory, except one February 2022 comparison

Table B.5: Laboratory Reporting Limit (LRL) Evaluation for Selenium Speciation Analyses, 2022

		Febru	uary 2022	Septen	nber 2022
Constituent	Units	LRLs ^a	No. Sample Results <lrl< th=""><th>LRLs ^a</th><th>No. Sample Results <lrl< th=""></lrl<></th></lrl<>	LRLs ^a	No. Sample Results <lrl< th=""></lrl<>
Selenium (Se)-Total	μg/L	0.165	0	0.165	0
Selenium (Se)-Dissolved	μg/L	0.165	0	0.165	0
Dimethylselenoxide-Dissolved	μg/L	0.010	0	0.010	6 (55%)
MeSe(IV) - Methylseleninic Acid (CH ₃ SeO ₂ H)-Dissolved	μg/L	0.010	0	0.010	3 (27%)
MeSe(VI) - Methaneselenonic Acid (CH ₄ O ₃ Se)-Dissolved	μg/L	0.010	2 (100%)	0.010	11 (100%)
Se(VI) - Selenate (SeO ₄ ²⁻)-Dissolved	μg/L	0.010	0	0.010	0
Se(IV) - Selenite (SeO ₃ ²⁻)-Dissolved	μg/L	0.010	0	0.020	0
SeCN - Selenocyanate (SeCN ¹⁻)- Dissolved	μg/L	0.010	2 (100%)	0.010	11 (100%)
SeMe - Selenomethionine (CH ₃ SeCH ₂ CH ₂ CH[NH ₂]CO ₂ H)-Dissolved	μg/L	0.010	2 (100%)	0.010	11 (100%)
Selenosulfate-Dissolved	μg/L	0.010	2 (100%)	0.010	11 (100%)
Unknown Selenium Species-Dissolved	μg/L	0.010	2 (100%)	0.010	11 (100%)

Notes: LRL = Laboratory Reporting Limit; No. = number; < = less than; μ g/L = micrograms per litre; % = percent; BC WQG = British Columbia Water Quality Guideline.

^a None of the LRLs exceeded the long-term selenium BC WQG for the protection of freshwater aquatic life (i.e., 2 μg/L; BCMOECCS 2021a).

Table B.6: Field Duplicate Results for Selenium Speciation Analyses, 2022

			RG_GHBP			RG_GHBP	1
Constituent	Units	F	ebruary 202	22	September 2022		
Constituent	Ullits	28-F	28-Feb-22		12-S	RPD (%)	
		220	3152	RPD (%)	2209284		KPD (/6)
Selenium (Se)-Total	μg/L	134	130	3.0	124	134	7.8
Selenium (Se)-Dissolved	μg/L	130	132	1.5	127	122	4.0
Dimethylselenoxide-Dissolved	μg/L	0.040	0.040	0	0.111	0.092	19
MeSe(IV) - Methylseleninic Acid (CH ₃ SeO ₂ H)-Dissolved	μg/L	0.052	0.051	1.9	0.061	0.068	11
MeSe(VI) - Methaneselenonic Acid (CH ₄ O ₃ Se)-Dissolved	μg/L	<0.010	<0.010	0	<0.010	<0.010	0
Se(VI) - Selenate (SeO ₄ ²⁻)-Dissolved	μg/L	132	130	1.5	137	138	0.73
Se(IV) - Selenite (SeO ₃ ²⁻)-Dissolved	μg/L	1.33	1.32	0.75	2.84	2.91	2.4
SeCN - Selenocyanate (SeCN¹-)- Dissolved	μg/L	<0.010	<0.010	0	<0.010	<0.010	0
SeMe - Selenomethionine (CH ₃ SeCH ₂ CH ₂ CH[NH ₂]CO ₂ H)-Dissolved	μg/L	<0.010	<0.010	0	<0.010	<0.010	0
Selenosulfate-Dissolved	μg/L	<0.010	<0.010	0	<0.010	<0.010	0
Unknown Selenium Species-Dissolved	μg/L	<0.010	<0.010	0	<0.010	<0.010	0

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; µg/L = micrograms per litre; < = less than; LRL = Laboratory Reporting Limit.

for selenate (RPD = 31%; RPD limit = 25%). Overall, laboratory analytical precision can be considered excellent.

The analytical laboratory also reported an estimate of precision for recoveries within 10 matrix spike duplicate (MSD) samples (Appendix C). Reported results were consistently within the DQO, which were set at a RPD \leq 20% for total selenium and a RPD \leq 25% for selenium species (Appendix Table B.1).

B3.4 Data Accuracy

Laboratory accuracy for selenium speciation analyses was evaluated based on 17 blank spike (BS) samples, 13 CRM samples, 10 MS samples, and 10 MSD samples. Recoveries of all BS, CRM, MS, and MSD samples from 2022 met the laboratory DQO (Appendix Table B.1). Therefore, the overall accuracy achieved by the laboratory was considered excellent.

B3.5 General Laboratory and Data Quality Flags

Selenosulphate concentrations in the two samples from February 2022 and three of the 11 samples from September 2022 were qualified as "estimated" concentrations due to the potential influence of chromatographic interference on the results. Although diluting and reanalyzing these samples could have potentially reduced the chromatographic interferences, the dilution would have elevated the LRL for selenomethionine to above the requested limit $(0.010 \ \mu g/L)$. To date, concentrations of selenosulphate and selenomethionine in water chemistry samples collected from Greenhills and Gardine creeks have been consistently less than their respective LRLs (Minnow 2021, 2022; see also Appendix C).

B3.6 Data Quality Statement

Selenium speciation data collected for this study were characterized by good detectability, concentrations less than LRLs in all laboratory blank samples, and good field and laboratory precision (as evaluated by field and laboratory duplicate samples) and accuracy. Therefore, the associated data are considered acceptable for this study.

B4 SEDIMENT CHEMISTRY

B4.1 Laboratory Reporting Limits

The analytical reports from ALS for sediment samples collected in September 2022 (see Appendix C) were examined to provide an inventory of constituents for which the sample results were less than the LRL (Appendix Table B.7). The LRLs were assessed relative to existing British Columbia Working Sediment Quality Guidelines (BC WSQG; BCMOECCS 2021b) and the alert concentration for selenium (BCMOECCS 2021a).

"Bulk" sediments collected in September 2022 were analyzed for concentrations of metals and polycyclic aromatic hydrocarbons (PAHs) and concentrations of metals in individual sediment fractions were quantified using Sequential Extraction Analysis (SEA). Overall, none of the reported LRLs for bulk or extractable metals exceeded BC WSQG (Appendix Table B.7).

Unlike the case for metals, LRLs for PAHs occasionally exceeded BC WSQG (Appendix Table B.7). Constituents with LRLs that exceeded the lower BC WSQG (i.e., the concentrations below which adverse biological effects would not be expected to occur under most circumstances) included acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, fluorene, 2-methylnaphphalene, and phenanthrene. Often, elevated (relative to BC WSQG) LRLs for PAHs are attributed to high moisture content and matrix interferences that necessitated raising the detection limits (Schvets 2020, pers. Comm.). No LRLs exceeded the upper BC WSQG (i.e., the concentrations above which effects to aquatic biota may be more frequently observed) for PAHs in sediment.

Overall, the LRLs for most constituents measured in sediment samples were considered appropriate for this study, except those for acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, fluorene, 2-methylnaphphalene, and phenanthrene.

B4.2 Laboratory Blanks

A total of 33 laboratory method blank samples were analyzed by ALS (see Appendix C for applicable laboratory reports). Of the 568 reported method blank results, 566 met the laboratory DQO. Two method blank results for exchangeable and adsorbed barium failed to meet the laboratory DQO; however, the associated sample results less than the LRL or greater than five-times the LRL were deemed reliable by the analytical laboratory (Appendix C). Overall, the results for this study indicated no inadvertent contamination of samples within the laboratory during analysis.

Table B.7: Laboratory Reporting Limit (LRL) Evaluation for Sediment Chemistry Analyses, September 2022 a

Constituent	Units	BC WSQG ^b		Range of LRLs	No. LRLs >	No. LRLs >	No. Sample Results
Constituent	Office	Lower	Upper	Range of LRLs	Lower Guideline	Upper Guideline	<lrl th="" °<=""></lrl>
hysical Tests	0/			1 0.05	ı		
Moisture 1 (1:2)	% pH units	-	-	0.25 0.10	-	-	0
article Size	pridinto			0.10			<u> </u>
Gravel (>2mm)	%	-	-	1.0	-	-	12 (55%)
Sand (2.00mm - 1.00mm)	%	-	-	1.0	-	-	7 (32%)
Sand (1.00mm - 0.50mm)	%	-	-	1.0	-	-	7 (32%)
Sand (0.50mm - 0.25mm) Sand (0.25mm - 0.125mm)	% %	-	-	1.0 1.0	-	-	5 (23%) 4 (18%)
6 Sand (0.25mm - 0.125mm)	%	<u>-</u>	-	1.0	-	-	1 (4.5%)
6 Silt (0.063mm - 0.0312mm)	%	<u> </u>	-	1.0	-	-	0
Silt (0.0312mm - 0.004mm)	%	-	-	1.0	-	-	0
6 Clay (<4µm)	%	-	-	1.0	-	-	0
rganic/Inorganic Carbon				•			
otal Organic Carbon ulk Metals	%	-	-	0.373 to 2.56	-	-	0
uminum (AI)	mg/kg	.	-	50		-	0
ntimony (Sb)	mg/kg	_	-	0.10	_	_	0
rsenic (As)	mg/kg	5.9	17	0.10	0	0	0
arium (Ba)	mg/kg	-	-	0.50	-	-	0
eryllium (Be)	mg/kg	-	-	0.10	-	-	0
ismuth (Bi)	mg/kg	-	-	0.20	-	-	19 (86%)
oron (B)	mg/kg	-	-	5.0	-	-	5 (23%)
admium (Cd)	mg/kg	0.6	3.5	0.020	0	0	0
alcium (Ca)	mg/kg	-	-	50	-	-	0
hromium (Cr)	mg/kg	37.3	90	0.50	0	0	0
obalt (Co)	mg/kg	35.7	197	0.10	-	- 0	0
opper (Cu) on (Fe)	mg/kg	35.7 21,200	197 43,766	0.50 50	0	0	0
on (Fe) ead (Pb)	mg/kg mg/kg	21,200 35	91.3	0.50	0	0	0
thium (Li)	mg/kg		91.3	2.0	-	-	0
agnesium (Mg)	mg/kg	<u> </u>	-	2.0	-	-	0
anganese (Mn)	mg/kg	460	1,100	1.0	0	0	0
lercury (Hg)	mg/kg	0.17	0.486	0.0050	0	0	0
olybdenum (Mo)	mg/kg	25	23,000	0.10	0	0	0
ickel (Ni)	mg/kg	16	75	0.50	0	0	0
hosphorus (P)	mg/kg	-	-	50	-	-	0
otassium (K)	mg/kg	-	-	100	-	-	0
elenium (Se)	mg/kg	_ d	_ d	0.20	-	0	0
ilver (Ag)	mg/kg	0.5	-	0.10	0	-	0
odium (Na)	mg/kg	-	-	50	-	-	0
trontium (Sr)	mg/kg	-	-	0.50	-	-	0 (440()
ulphur (S) hallium (TI)	mg/kg mg/kg	<u>-</u> -	-	1,000 0.050	-	-	9 (41%)
in (Sn)	mg/kg	<u> </u>	-	2.0	-	-	22 (100%)
itanium (Ti)	mg/kg	<u>-</u>	-	1.0	-	-	0
ungsten (W)	mg/kg	_	-	0.50	_	_	22 (100%)
ranium (U)	mg/kg	-	-	0.050	-	-	0
anadium (V)	mg/kg	-	-	0.20	-	-	0
inc (Zn)	mg/kg	123	315	2.0	0	0	0
rconium (Zr)	mg/kg	-	-	1.0	-	-	7 (32%)
xchangeable and Adsorbed Me					1		00 (4000)
luminum (AI) ntimony (Sb)	mg/kg mg/kg	-	-	50 0.10	-	-	22 (100%) 22 (100%)
rsenic (As)	mg/kg	5.9	17	0.050	0	0	19 (86%)
arium (Ba)	mg/kg	- -	-	0.50	-	-	0
eryllium (Be)	mg/kg	-	-	0.20	-	-	22 (100%)
ismuth (Bi)	mg/kg	-	-	0.20	-	-	22 (100%)
admium (Ćd)	mg/kg	0.6	3.5	0.050	0	0	4 (18%)
alcium (Ĉa)	mg/kg	-	-	50	-	-	0
hromium (Cr)	mg/kg	37.3	90	0.50	0	0	22 (100%)
obalt (Co)	mg/kg	-	-	0.10	-	-	2 (9.1%)
opper (Cu)	mg/kg	35.7	197	0.50	0	0	14 (64%)
on (Fe)	mg/kg	21,200	43,766	50	0	0	22 (100%)
ead (Pb) thium (Li)	mg/kg	35	91.3	0.50 5.0	0 -	0	22 (100%) 22 (100%)
tnium (Li) anganese (Mn)	mg/kg mg/kg	460	1,100	1.0	- 0	0	22 (100% ₎
olybdenum (Mo)	mg/kg	25	23,000	0.50	0	0	22 (100%)
ckel (Ni)	mg/kg	16	75	0.50	0	0	9 (41%)
nosphorus (P)	mg/kg	-	-	50	-	-	22 (100%)
otassium (K)	mg/kg	-	-	100	-	-	2 (9.1%)
elenium (Se)	mg/kg	_ d	_ d	0.20	-	0	12 (55%)
Iver (Ag)	mg/kg	0.5	-	0.10	0	-	22 (100%)
odium (Na)	mg/kg	-	-	100	-	-	21 (95%)
rontium (Sr)	mg/kg	-	-	0.50	-	-	0
nallium (TI)	mg/kg	-	-	0.050	-	-	22 (100%)
n (Sn)	mg/kg	-	-	2.0	-	-	22 (100%)
tanium (Ti)	mg/kg	-	-	1.0	-	-	22 (100%)
ranium (U)	mg/kg	-	-	0.050	-	-	12 (55%)
anadium (V)	mg/kg	_	-	0.20	-	-	22 (100%)
	mg/kg	123	315	1.0	0	0	22 (100%)
Zinc (Zn)	100 m /l cm	100	215	1.0	I ∩	0	22 (100

Shading indicates an LRL greater than the lower BC WSQG.
Shading indicates an LRL greater than the both the lower and upper BC WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; LRL = Laboratory Reporting Limit; No. = number; > = greater than; < = less than; % = percent; - = no data/not applicable; mm = millimetres; µm = micrometres; mg/kg = milligrams per kilogram; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^c The total number of samples analyzed in 2022 was n = 22 (n = 21 sediment samples and n = 1 duplicate sample).

d The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table B.7: Laboratory Reporting Limit (LRL) Evaluation for Sediment Chemistry Analyses, September 2022 a

Constituent	Units	BC W	∕SQG ^b	Range of LRLs	No. LRLs >	No. LRLs >	No. Sample Results
		Lower	Upper		Lower Guideline	Upper Guideline	<lrl <sup="">c</lrl>
Carbonate Metals Aluminum (AI)	mg/kg	<u>-</u>	-	50		-	22 (100%)
Antimony (Sb)	mg/kg	-	-	0.10	-	-	22 (100%)
Arsenic (As)	mg/kg	5.9	17	0.050	0	0	9 (41%)
Barium (Ba)	mg/kg	-	-	2.0	-	-	0 (1000()
Beryllium (Be) Bismuth (Bi)	mg/kg mg/kg	<u>-</u>	-	0.20 0.20	-	-	22 (100%) 22 (100%)
Cadmium (Cd)	mg/kg	0.6	3.5	0.050	0	0	0
Calcium (Ĉa)	mg/kg	-	-	50	-	-	0
Chromium (Cr)	mg/kg	37.3	90	5.0 0.10	0	0	22 (100%) 0
Cobalt (Co) Copper (Cu)	mg/kg mg/kg	35.7	197	0.10	- 0	- 0	22 (100%)
Iron (Fe)	mg/kg	21,200	43,766	50	0	0	21 (95%)
Lead (Pb)	mg/kg	35	91.3	0.50	0	0	19 (86%)
Lithium (Li) Manganese (Mn)	mg/kg	460	1,100	5.0 5.0	- 0	- 0	22 (100%) 0
Molybdenum (Mo)	mg/kg mg/kg	25	23,000	0.50	0	0	22 (100%)
Nickel (Ni)	mg/kg	16	75	2.0	0	0	8 (36%)
Phosphorus (P)	mg/kg	-	-	50	-	-	22 (100%)
Selenium (Se)	mg/kg	_ d	_ d	0.20 0.10	- 0	0	14 (64%)
Silver (Ag) Strontium (Sr)	mg/kg mg/kg	0.5 -	-	5.0	-	-	22 (100%)
Thallium (TI)	mg/kg	-	-	0.050	-	-	22 (100%)
Tin (Sn)	mg/kg	-	-	2.0	-	-	22 (100%)
Titanium (Ti)	mg/kg	-	-	5.0	-	-	22 (100%)
Uranium (U) Vanadium (V)	mg/kg mg/kg	-	-	0.050 0.20	-	-	1 (4.5%) 22 (100%)
Zinc (Zn)	mg/kg	123	315	1.0	0	0	0
Easily-reducible Metals and Ir							
Aluminum (Al)	mg/kg	-	-	50	-	-	0
Antimony (Sb) Arsenic (As)	mg/kg mg/kg	5.9	17	0.10 0.050	- 0	- 0	20 (91%) 0
Barium (Ba)	mg/kg	<u> </u>	- 17	0.030	-	-	0
Beryllium (Be)	mg/kg	-	-	0.20	-	-	0
Bismuth (Bi)	mg/kg	-	-	0.20	-	-	22 (100%)
Cadmium (Cd) Calcium (Ca)	mg/kg	0.6	3.5	0.050	0	0	0
Calcium (Ca) Chromium (Cr)	mg/kg mg/kg	37.3	90	50 0.50	- 0	- 0	0
Cobalt (Co)	mg/kg	-	-	0.10	-	-	0
Copper (Cu)	mg/kg	35.7	197	0.50	0	0	7 (32%)
Iron (Fe)	mg/kg	21,200	43,766	50	0	0	0
Lead (Pb) Lithium (Li)	mg/kg mg/kg	35 -	91.3	0.50 5.0	0 -	0	0 22 (100%)
Manganese (Mn)	mg/kg	460	1,100	1.0	0	0	0
Molybdenum (Mo)	mg/kg	25	23,000	0.50	0	0	22 (100%)
Nickel (Ni)	mg/kg	16	75	0.50	0	0	0
Phosphorus (P) Selenium (Se)	mg/kg mg/kg	_ d	- d	50 0.20	-	- 0	0 11 (50%)
Silver (Ag)	mg/kg	0.5	-	0.20	0	-	15 (68%)
Strontium (Sr)	mg/kg	-	-	0.50	-	-	0
Thallium (TI)	mg/kg	-	-	0.050	-	-	22 (100%)
Tin (Sn)	mg/kg	-	-	2.0	-	-	22 (100%)
Titanium (Ti) Uranium (U)	mg/kg mg/kg	<u>-</u>	-	1.0 0.050	-	-	22 (100%) 0
Vanadium (V)	mg/kg		-	0.20	-	-	0
Zinc (Zn)	mg/kg	123	315	1.0	0	0	0
Organic-bound Metals			3.0				Ţ.
Aluminum (AI)	mg/kg	-	-	50	-	-	0
Antimony (Sb) Arsenic (As)	mg/kg	- 5.9	17	0.10 0.050	- 0	- 0	22 (100%) 0
Barium (Ba)	mg/kg mg/kg	5.9 -	- 17	0.050	-	-	0
Beryllium (Be)	mg/kg	-	-	0.20	-	-	22 (100%)
Bismuth (Bi)	mg/kg	-	-	0.20	-	-	22 (100%)
Cadmium (Cd) Calcium (Ca)	mg/kg	0.6	3.5	0.050 50	0	0	1 (4.5%) 0
Chromium (Cr)	mg/kg mg/kg	37.3	90	0.50	0	0	0
Cobalt (Co)	mg/kg	-	-	0.10	-	-	0
Copper (Cu)	mg/kg	35.7	197	0.50	0	0	0
Iron (Fe) Lead (Pb)	mg/kg	21,200 35	43,766 91.3	50 0.50	0	0	0 3 (14%)
Lead (Pb) Lithium (Li)	mg/kg mg/kg	35 -	91.3	5.0	-	-	22 (100%)
Manganese (Mn)	mg/kg	460	1,100	1.0	0	0	0
Molybdenum (Mo)	mg/kg	25	23,000	0.50	0	0	22 (100%)
Nickel (Ni)	mg/kg	16 - ^d	75 - ^d	0.50	0	0	0
Selenium (Se) Silver (Ag)	mg/kg mg/kg	0.5	_ u	0.20 0.10	0	0	0 22 (100%)
Strontium (Sr)	mg/kg	-	-	0.50	-	-	0
Thallium (TI)	mg/kg	-	-	0.050	-	-	22 (100%)
Tin (Sn)	mg/kg	-	-	2.0	-	-	22 (100%)
Titanium (Ti) Uranium (U)	mg/kg mg/kg	-	-	1.0 0.050	-	-	3 (14%) 0
Vanadium (V)	mg/kg mg/kg	<u>-</u> -	-	0.050	-	-	0
Zinc (Zn)	mg/kg	123	315	1.0	0	0	0

Shading indicates an LRL greater than the lower BC WSQG.

Shading indicates an LRL greater than the both the lower and upper BC WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; LRL = Laboratory Reporting Limit; No. = number; > = greater than; < = less than; % = percent; - = no data/not applicable; mm = millimetres; μ m = micrometres; μ m = m

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^c The total number of samples analyzed in 2022 was n = 22 (n = 21 sediment samples and n = 1 duplicate sample).

d The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table B.7: Laboratory Reporting Limit (LRL) Evaluation for Sediment Chemistry Analyses, September 2022 a

Constituent	Units	BC WSQG ^b		Range of LRLs	No. LRLs >	No. LRLs >	No. Sample Results
		Lower	Upper	J	Lower Guideline	Upper Guideline	<lrl <sup="">c</lrl>
Residual Metals							
Aluminum (AI)	mg/kg	-	-	50	-	-	0
Antimony (Sb)	mg/kg	-	-	0.10	-	-	0
Arsenic (As)	mg/kg	5.9	17	5.0	0	0	18 (82%)
Barium (Ba)	mg/kg	-	-	2.0	-	-	0
Beryllium (Be)	mg/kg	-	-	0.20	-	-	0
Bismuth (Bi)	mg/kg	-	-	0.20	-	-	22 (100%)
Cadmium (Cd)	mg/kg	0.6	3.5	0.050	0	0	2 (9.1%)
Calcium (Ca)	mg/kg	- 07.0	-	50	-	-	0
Chromium (Cr)	mg/kg	37.3	90	5.0	0	0	0
Cobalt (Co)	mg/kg	-	-	0.10	-	-	0
Copper (Cu)	mg/kg	35.7	197	0.50	0	0	0
Iron (Fe)	mg/kg	21,200	43,766	50	0	0	0
Lead (Pb)	mg/kg	35	91.3	0.50	0	0	0 (45%)
Lithium (Li)	mg/kg	-	- 1 100	5.0	-	-	10 (45%)
Manganese (Mn)	mg/kg	460	1,100	5.0	0	0	0
Molybdenum (Mo)	mg/kg	25	23,000	0.50	0	0	1 (4.5%)
Nickel (Ni)	mg/kg	16 - ^d	75 - ^d	2.0	0	0	0
Selenium (Se)	mg/kg			0.20	-	0	-
Silver (Ag)	mg/kg	0.5	-	0.10 5.0	0	-	1 (4.5%)
Strontium (Sr)	mg/kg	-	-		-	-	0
Thallium (TI)	mg/kg	-	-	0.050	-	-	
Tin (Sn)	mg/kg	-	-	2.0	-	-	22 (100%)
Titanium (Ti) Uranium (U)	mg/kg	-	-	5.0 0.050	-	-	0
Vanadium (V)	mg/kg	<u> </u>	-	0.00	-	-	0
Zinc (Zn)	mg/kg mg/kg	123	315	1.0	0	0	0
Polycyclic Aromatic Hydrocark		123	313	1.0		U	U
Acenaphthene		0.00671	0.0889	0.050	22 (100%)	0	1 (4.5%)
·	mg/kg				` '	_	
Acenaphthylene	mg/kg	0.00587	0.128	0.050	22 (100%)	0	13 (59%)
Acridine	mg/kg	-	-	0.050	-	-	1 (4.5%)
Anthracene	mg/kg	0.0469	0.245	0.050	22 (100%)	0	22 (100%)
Benz(a)anthracene	mg/kg	0.0317	0.385	0.050	22 (100%)	0	3 (14%)
Benzo(a)pyrene	mg/kg	0.0319	0.782	0.050	22 (100%)	0	7 (32%)
Benzo(b&j)fluoranthene	mg/kg	-	-	0.050	-	-	1 (4.5%)
Benzo(b+j+k)fluoranthene	mg/kg	-	_	0.075	_	_	1 (4.5%)
Benzo(g,h,i)perylene		0.17	3.2	0.050	_	0	
(0)	mg/kg	0.17			0		3 (14%)
Benzo(k)fluoranthene	mg/kg	0.24	13.4	0.050	0	0	11 (50%)
Chrysene	mg/kg	0.0571	0.862	0.050	0	0	1 (4.5%)
Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	0.050	22 (100%)	0	11 (50%)
Fluoranthene	mg/kg	0.111	2.355	0.050	0	0	3 (14%)
Fluorene	mg/kg	0.0212	0.144	0.050	22 (100%)	0	1 (4.5%)
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	3.2	0.050	0	0	13 (59%)
1-Methylnaphthalene	mg/kg	-	-	0.030	-	-	0
2-Methylnaphthalene	mg/kg	0.0202	0.201	0.030	22 (100%)	0	0
Naphthalene	mg/kg	0.0346	0.391	0.010 to 0.030	0	0	0
Phenanthrene	mg/kg	0.0419	0.515	0.050	22 (100%)	0	0
Pyrene		0.053	0.875	0.050	0	0	1 (4.5%)
	mg/kg						
Quinoline	mg/kg	-	-	0.050	-	-	22 (100%)

Shading indicates an LRL greater than the lower BC WSQG.

Shading indicates an LRL greater than the both the lower and upper BC WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; LRL = Laboratory Reporting Limit; No. = number; > = greater than; < = less than; % = percent; - = no data/not applicable; mm = millimetres; μ m = micrometres; μ m = m

^a The number of significant digits reported in the table is consistent with source material (e.g., BCMOECCS 2021a,b) and laboratory reports.

^b BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^c The total number of samples analyzed in 2022 was n = 22 (n = 21 sediment samples and n = 1 duplicate sample).

^d The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

B4.3 Data Precision

B4.3.1 Field Duplicate Samples

Two pairs of field duplicate samples were collected to assess the precision of field sampling; however, only one QC sample was logged by the analytical laboratory (Appendix Table B.8). The QC samples for sediment were collected as split samples (i.e., a larger sample was homogenized and split into two duplicate sub-samples); however, some variability is expected, based on the heterogeneity of sediments, and this should be considered when interpreting the sediment chemistry results.

Teck does not currently have DQO set for sediment field duplicate samples. However, applying the DQO for laboratory duplicates (Appendix Table B.1) is considered a highly conservative estimate of field sampling precision, given that field sampling conditions and sample homogenization cannot be controlled as well as in the laboratory. Most (i.e., 77%) of paired concentrations, including all metals fractions and PAHs, were within laboratory DQO, based on the single set of field duplicates collected in 2022 (Appendix Table B.8). This is attributed to a number of sample results (particularly those for PAHs) being relatively close to (i.e., <10-times) the LRL. Regardless, the collection of replicate samples from each area is expected to average out this type of variability and support the overall results and comparisons.

B4.3.2 Laboratory Duplicate Samples

A total of 36 laboratory duplicate samples were used to evaluate laboratory precision (see Appendix C for the relevant laboratory reports). For almost all of the 596 comparisons that were reported, RPDs were within laboratory DQO (Appendix Table B.1). The first exception was a single paired result for calcium in the easily reducible metals and iron oxides fraction; the RPD between paired results was 47% and the DQO was 30%. The only other exception was a single paired result for strontium in the easily reducible metals and iron oxides fraction; the RPD between paired results was 33% and the DQO was 30%. The analytical laboratory attributed these differences to sample heterogeneity. Overall, analytical precision was deemed excellent for the sediment chemistry samples collected in September 2022.

B4.4 Data Accuracy

Data accuracy was evaluated based on the analysis of CRM, LCS, and MS. Specifically, 15 CRM samples, 36 LCS samples, and three MS samples were analyzed to produce 105, 597, and 60 individual results, respectively (see Appendix C). All CRM, LCS, and MS samples met the laboratory DQO. Overall, the accuracy achieved by the laboratory for this study can be considered excellent.

Table B.8: Field Duplicate Results for Sediment Chemistry Analyses, September 2022

	RG_GAUT					
Constituent	Units	14-S	DDD (0/)			
		CG22	213623	RPD (%)		
Physical Tests						
Moisture pH (1:2)	% pH units	26.1 8.26	38.6 8.35	39 1.1		
Particle Size	pri units	0.20	6.33	1.1		
% Gravel (>2mm)	%	10.2	3.0	109		
% Sand (2.00mm - 1.00mm)	%	6.1	3.6	52		
% Sand (1.00mm - 0.50mm)	%	13.5	2.2	144		
% Sand (0.50mm - 0.25mm)	%	13.8	4.7	98		
% Sand (0.25mm - 0.125mm) % Sand (0.125mm - 0.063mm)	%	9.4 6.9	13.7 21.9	37 104		
% Silt (0.063mm - 0.0312mm)	%	12.8	21.7	52		
% Silt (0.0312mm - 0.004mm)	%	20.6	24.2	16		
% Clay (<4μm)	%	6.7	5.0	29		
Organic/Inorganic Carbon		1 0.4		140		
Total Organic Carbon Bulk Metals	%	9.4	2.6	113		
Aluminum (Al)	mg/kg	8,130	16,200	66		
Antimony (Sb)	mg/kg	0.89	0.40	76		
Arsenic (As)	mg/kg	6.99	7.82	11		
Barium (Ba)	mg/kg	312	700	77		
Beryllium (Be)	mg/kg	0.78	0.86	10		
Bismuth (Bi) Boron	mg/kg mg/kg	<0.20 5.4	0.23 17.9	14 107		
Cadmium (Cd)	mg/kg	0.918	0.844	8.4		
Calcium (Ca)	mg/kg	12,000	25,500	72		
Chromium (Cr)	mg/kg	11.6	19.0	48		
Cobalt (Co)	mg/kg	11.1	8.11	31		
Copper (Cu) Iron (Fe)	mg/kg mg/kg	20.0 19,500	19.9 23,500	0.50 19		
Lead (Pb)	mg/kg	13.6	13.6	0		
Lithium (Li)	mg/kg	12.4	25.4	69		
Magnesium (Mg)	mg/kg	3,920	8,220	71		
Manganese (Mn)	mg/kg	622	324	63		
Mercury (Hg)	mg/kg	0.0668	0.0286	80 43		
Molybdenum (Mo) Nickel (Ni)	mg/kg mg/kg	1.42 33.1	2.19 24.8	29		
Phosphorus (P)	mg/kg	1,300	1,560	18		
Potassium (K)	mg/kg	1,500	3,380	77		
Selenium (Se)	mg/kg	1.22	0.67	58		
Silver (Ag)	mg/kg	0.27	0.13	70		
Sodium (Na) Strontium (Sr)	mg/kg mg/kg	56 47.8	273 97.7	132 69		
Sulphur (S)	mg/kg	<1,000	<1,000	0		
Thallium (TI)	mg/kg	0.140	0.423	101		
Tin (Sn)	mg/kg	<2.0	<2.0	0		
Titanium (Ti)	mg/kg	10.1	20.8	69		
Tungsten (W) Uranium (U)	mg/kg mg/kg	<0.50 0.845	<0.50 0.712	0 17		
Vanadium (V)	mg/kg	26.5	31.2	16		
Zinc (Zn)	mg/kg	113	101	11		
Zirconium (Zr)	mg/kg	1.2	1.0	18		
Exchangeable and Adsorbed Metals		T ==				
Aluminum (Al)	mg/kg	<50 <0.10	<50 <0.10	0		
Antimony (Sb) Arsenic (As)	mg/kg mg/kg	<0.10	0.052	3.9		
Barium (Ba)	mg/kg	46.1	224	132		
Beryllium (Be)	mg/kg	<0.20	<0.20	0		
Bismuth (Bi)	mg/kg	<0.20	<0.20	0		
Cadmium (Cd)	mg/kg	0.173	<0.050	110		
Calcium (Ca) Chromium (Cr)	mg/kg mg/kg	3,800 <0.50	2,500 <0.50	41 0		
Cobalt (Co)	mg/kg	0.24	<0.10	82		
Copper (Cu)	mg/kg	<0.50	<0.50	0		
Iron (Fe)	mg/kg	<50	<50	0		
Lead (Pb)	mg/kg	<0.50	<0.50	0		
Lithium (Li)	mg/kg mg/kg	<5.0 56.7	<5.0 32.3	0 55		
Manganese (Mn) Molybdenum (Mo)	mg/kg mg/kg	<0.50	<0.50	0		
Nickel (Ni)	mg/kg	<0.50	<0.50	0		
Phosphorus (P)	mg/kg	<50	<50	0		
Potassium (K)	mg/kg	130	190	38		
Selenium (Se)	mg/kg	<0.20	<0.20	0		
Silver (Ag)	mg/kg mg/kg	<0.10 <100	<0.10 350	0 111		
2000UU UVA)		12.6	42.4	108		
Sodium (Na) Strontium (Sr)	HIQ/KU					
Strontium (Sr)	mg/kg mg/kg	<0.050	<0.050	0		
Strontium (Sr) Thallium (TI) Tin (Sn)	mg/kg mg/kg	<2.0	<2.0	0		
Strontium (Sr) Thallium (TI) Tin (Sn) Titanium (Ti)	mg/kg mg/kg mg/kg	<2.0 <1.0	<2.0 <1.0	0		
Strontium (Sr) Thallium (TI) Tin (Sn)	mg/kg mg/kg	<2.0	<2.0	0		

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; LRL = Laboratory Reporting Limit.

Table B.8: Field Duplicate Results for Sediment Chemistry Analyses, September 2022

		RG_GAUT				
Constituent	Units	14-S	RPD (%)			
Carbonate Metals		CG22	213623			
Aluminum (Al)	mg/kg	<50	<50	0		
Antimony (Sb)	mg/kg	<0.10	<0.10	0		
Arsenic (As)	mg/kg	0.058	0.164	95		
Barium (Ba) Beryllium (Be)	mg/kg mg/kg	35 <0.20	123 <0.20	111 0		
Bismuth (Bi)	mg/kg	<0.20	<0.20	0		
Cadmium (Cd)	mg/kg	0.19	0.245	25		
Calcium (Ca)	mg/kg	3,010	13,800	128		
Chromium (Cr)	mg/kg	<5.0 0.71	<5.0	0 67		
Cobalt (Co) Copper (Cu)	mg/kg mg/kg	<0.50	1.42 <0.50	0		
Iron (Fe)	mg/kg	<50	563	167		
Lead (Pb)	mg/kg	<0.50	1.19	82		
Lithium (Li)	mg/kg	<5.0	<5.0	0		
Manganese (Mn) Molybdenum (Mo)	mg/kg	96.6 <0.50	126 <0.50	26 0		
Nickel (Ni)	mg/kg mg/kg	<0.50	2.1	4.9		
Phosphorus (P)	mg/kg	<50	<50	0		
Selenium (Se)	mg/kg	<0.20	<0.20	0.0		
Silver (Ag)	mg/kg	<0.10	<0.10	0		
Strontium (Sr) Thallium (TI)	mg/kg	5.8 <0.050	27.7 <0.050	131		
Tin (Sn)	mg/kg mg/kg	<0.050	<0.050	0		
Titanium (Ti)	mg/kg	<5.0	<5.0	0		
Uranium (U)	mg/kg	0.051	0.055	7.5		
Vanadium (V)	mg/kg	<0.20	<0.20	0		
Zinc (Zn) Easily-reducible Metals and Iron Oxides	mg/kg	4.7	9.1	64		
Aluminum (Al)	mg/kg	609	655	7.3		
Antimony (Sb)	mg/kg	<0.10	<0.10	0		
Arsenic (As)	mg/kg	0.556	0.865	43		
Barium (Ba)	mg/kg	50.8	82.6	48		
Beryllium (Be) Bismuth (Bi)	mg/kg mg/kg	0.29 <0.20	0.24 <0.20	19 0		
Cadmium (Cd)	mg/kg	0.445	0.358	22		
Calcium (Ca)	mg/kg	3,320	8,360	86		
Chromium (Cr)	mg/kg	0.90	1.5	50		
Cobalt (Co)	mg/kg	4.17	2.37	55		
Copper (Cu) Iron (Fe)	mg/kg mg/kg	0.65 3,680	0.90 4,140	32 12		
Lead (Pb)	mg/kg	3.19	4.56	35		
Lithium (Li)	mg/kg	<5.0	<5.0	0		
Manganese (Mn)	mg/kg	191	90.3	72		
Molybdenum (Mo)	mg/kg	<0.50	<0.50	0		
Nickel (Ni) Phosphorus (P)	mg/kg mg/kg	10.6 142	5.43 74	65 63		
Selenium (Se)	mg/kg	<0.20	<0.20	0		
Silver (Ag)	mg/kg	0.1	<0.10	0.0		
Strontium (Sr)	mg/kg	6.63	12	58		
Thallium (TI)	mg/kg	<0.050	<0.050	0		
Tin (Sn) Titanium (Ti)	mg/kg mg/kg	<2.0 <1.0	<2.0 <1.0	0		
Uranium (U)	mg/kg	0.178	0.123	37		
Vanadium (V)	mg/kg	2.9	2.88	0.69		
Zinc (Zn)	mg/kg	26.4	24.4	7.9		
Organic-bound Metals Aluminum (AI)	mg/kg	1,740	1,280	30		
Antimony (Sb)	mg/kg	<0.10	<0.10	0		
Arsenic (As)	mg/kg	0.495	0.075	147		
Barium (Ba)	mg/kg	23.7	18.8	23		
Beryllium (Be)	mg/kg	<0.20	<0.20	0		
Bismuth (Bi) Cadmium (Cd)	mg/kg mg/kg	<0.20 0.085	<0.20 <0.050	0 52		
Calcium (Ca)	mg/kg	1050	864	19		
Chromium (Cr)	mg/kg	3.77	2.40	44		
Cobalt (Co)	mg/kg	1.03	0.75	31		
Copper (Cu)	mg/kg	7.32	3.82	63		
Iron (Fe) Lead (Pb)	mg/kg mg/kg	1,960 0.88	1,090 0.64	57 32		
Lithium (Li)	mg/kg	<5.0	<5.0	0		
Manganese (Mn)	mg/kg	17.1	8.2	70		
Molybdenum (Mo)	mg/kg	<0.50	<0.50	0		
Nickel (Ni)	mg/kg	6.02	3.59	51		
Selenium (Se) Silver (Ag)	mg/kg mg/kg	1.01 <0.10	0.36 <0.10	95 0		
Strontium (Sr)	mg/kg	4.64	3.51	28		
Thallium (TI)	mg/kg	<0.050	<0.050	0		
Tin (Sn)	mg/kg	<2.0	<2.0	0		
Titanium (Ti)	mg/kg	2.2	<1.0	75		
Uranium (U)	mg/kg	0.279	0.099	95		
Vanadium (V) Zinc (Zn)	mg/kg mg/kg	4.45 9.1	1.53 5.9	98 43		
∠∨ (∠!! <i>)</i>	ı ıııg/kg	ا . ت	J.3	+3		

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; LRL = Laboratory Reporting

Table B.8: Field Duplicate Results for Sediment Chemistry Analyses, September 2022

		RG_GAUT						
Constituent	Units	14-Sep-22						
			13623	RPD (%)				
Residual Metals								
Aluminum (Al)	mg/kg	7,710	13,700	56				
Antimony (Sb)	mg/kg	0.76	0.32	81				
Arsenic (As)	mg/kg	<5.00	6.6	28				
Barium (Ba)	mg/kg	126	109	14				
Beryllium (Be)	mg/kg	0.33	0.47	35				
Bismuth (Bi)	mg/kg	<0.20	<0.20	0				
Cadmium (Cd)	mg/kg	0.074	0.068	8.5				
Calcium (Ca)	mg/kg	518	1,650	104				
Chromium (Cr)	mg/kg	11.0	16.1	38				
Cobalt (Co)	mg/kg	2.78	2.64	5.2				
Copper (Cu)	mg/kg	12.6	13.4	6.2				
Iron (Fe)	mg/kg	10,400	17,200	49				
Lead (Pb)	mg/kg	6.99	5.13	31				
Lithium (Li)	mg/kg	6.4	15.7	84				
Manganese (Mn)	mg/kg	39.9	45.5	13				
Molybdenum (Mo)	mg/kg	1.07	1.79	50				
Nickel (Ni)	mg/kg	11.4	12.4	8.4				
Selenium (Se)	mg/kg	0.35	0.24	37				
Silver (Ag)	mg/kg	0.14	<0.10	33				
Strontium (Sr)	mg/kg	20.8	11.3	59				
Thallium (TI)	mg/kg	0.145	0.282	64				
Tin (Sn)	mg/kg	<2.0	<2.0	0				
Titanium (Ti)	mg/kg	24.8	27.6	11				
Uranium (U)	mg/kg	0.339	0.371	9.0				
Vanadium (V)	mg/kg	28.6	29.1	1.7				
Zinc (Zn)	mg/kg	59.9	57.1	4.8				
Polycyclic Aromatic Hydrocarbons								
Acenaphthene	mg/kg	0.167	<0.050	108				
Acenaphthylene	mg/kg	<0.050	<0.050	0				
Acridine	mg/kg	0.282	<0.050	140				
Anthracene	mg/kg	<0.050	<0.050	0				
Benz(a)anthracene	mg/kg	0.090	<0.050	57				
Benzo(a)pyrene	mg/kg	0.060	<0.050	18				
Benzo(b&j)fluoranthene	mg/kg	0.248	<0.050	133				
Benzo(b+j+k)fluoranthene	mg/kg	0.248	<0.075	107				
Benzo(g,h,i)perylene	mg/kg	0.094	<0.050	61				
Benzo(k)fluoranthene	mg/kg	<0.050	<0.050	0				
Chrysene	mg/kg	0.537	<0.050	166				
Dibenz(a,h)anthracene	mg/kg	<0.050	<0.050	0				
Fluoranthene	mg/kg	0.073	<0.051	37				
Fluorene	mg/kg	0.395	<0.050	155				
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.050	<0.050	0				
1-Methylnaphthalene	mg/kg	2.38	0.031	195				
2-Methylnaphthalene	mg/kg	4.65	0.046	196				
Naphthalene	mg/kg	1.57	0.037	191				
Phenanthrene	mg/kg	1.79	0.069	185				
Pyrene	mg/kg	0.18	<0.050	113				
Quinoline	mg/kg	<0.050	<0.050	0				

Notes: The RPD was calculated using <LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL. RPD = relative percent difference; % = percent; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; LRL = Laboratory Reporting Limit.

B4.5 General Laboratory and Data Quality Flags

The analytical hold times for analysis of mercury and PAHs in bulk sediment samples from RG_GAUT on Gardine Creek and Greenhills Creek Sedimentation Pond were exceeded (see Appendix C). These samples were not located and logged immediately following receipt by the analytical laboratory.

B4.6 Data Quality Statement

Sediment quality data collected for the GC LAEMP in 2022 are of acceptable quality as characterized by good detectability, negligible constituent concentrations in method blanks, good laboratory precision, and excellent laboratory accuracy. Therefore, the associated data can be used to derive conclusions with confidence.

B5 BENTHIC INVERTEBRATE COMMUNITY

The analysis of benthic invertebrate community samples involved a concurrent assessment of data quality, including sub-sampling accuracy and precision and percent recovery of organisms. The analytical laboratories (ZEAS Inc. and Cordillera Consulting) provided laboratory data files and original QC reports for benthic invertebrate sample processing (see Appendix C).

All but one of the six benthic invertebrate community samples used to estimate sub-sampling precision met the DQO of ≤20% (i.e., estimated precision was within 22.3%; Appendix Table B.9). Organism densities (area-based samples) and individual counts (timed kick samples) were estimated for sub-sample fractions and compared to total values to estimate sub-sampling accuracy. Results for the sub-samples were within 16% of actual densities or organism counts; therefore, all sub-samples met the DQO of ≤20% for sub-sampling accuracy. Sizes of sub-sampled fractions range from 5% of a sample to a whole sample (Appendix Table B.10).

To measure the effectiveness of the sorters, 10% of samples were selected at random for re-sorting analysis by a different sorter. An average recovery rate of 96% was achieved for the six samples that were evaluated by ZEAS Inc. and the recovery rate for the single sample re-sort completed by Cordillera Consulting was 97% (Appendix Table B.11). All samples achieved the DQO for sorting efficiency (i.e., \geq 90% recovery for area-based samples and \geq 95% for timed kick samples). Sorting efficiency (i.e., percent recovery) of benthic invertebrate samples was excellent.

Cordillera Consulting also completed blind checks on 10% of samples to assess rates of taxonomic misidentification, enumeration error, and errors due to questionable or insufficient taxonomic resolution. These checks are completed in accordance with Canadian Aquatic Biomonitoring Network (CABIN) protocols for assessing misidentification (Environment Canada 2012). The average total identification error rate, percent differences in enumeration and taxonomic disagreement, and Bray-Curtis Dissimilarity Index of checked samples were within DQO (i.e., ≤5% or 0.5 for Bray-Curtis Dissimilarity Index; Appendix Tables B.1 and B.12).

³ Consistent with CABIN requirements (Environment Canada 2012).



Table B.9: Calculation of Benthic Invertebrate Community Sub-sampling Error, September 2022 ^a

Station	Whole Organisms	Number of Organisms in	Actual Density	% ra	ision ange		uracy ange				
	Organisins	Fraction 1	Fraction 2	Fraction 3	Fraction 4	Fraction 5	Density	Min	Max	Min	Max
Area-based S	Area-based Samples (ZEAS Inc.) ^b										
RG_GHBP-6	-	196	200	-	-	-	396	2.0	-	1.0	-
RG_GHFF-1	-	144	164	-	-	-	308	12.2	-	6.5	-
RG_GHUT-6	-	141	179	-	-	-	-	21.2	-	-	-
RG_GHP-6	-	262	276	289	337	-	1,164	4.5	22.3	0.7	15.8
RG_GHP-6	-	538	626	-	-	-	1,164	14.1	-	7.6	-
Timed Kick S	Fimed Kick Samples (Cordillera Consulting)										
RG_GHDT-3	=	354	358	-	-	-	712	1.12	1.12	0.56	0.56

Highlighted values did not meet the DQO of ≤ 20%.

Notes: % = percent; min = minimum; max = maximum; - = no data/not applicable; DQO = data quality objective; ≤ = less than or equal to.

^a The number of significant digits reported in the table is consistent with the laboratory reports.

^b Whole large organisms were excluded from calculations.

Table B.10: Benthic Invertebrate Community Sample Fractions Sorted, September 2022

Station	Fraction Sorted ^a	Station	Fraction Sorted ^a	Station	Fraction Sorted ^a			
Area-based Sa	Area-based Samples (ZEAS Inc.)							
RG_GHUT-1	1/4, 1/16 ^b	RG_GHDT-5	1/2	RG_GHBP-3	1/4			
RG_GHUT-2	1/4	RG_GHDT-6	Whole	RG_GHBP-4	1/4			
RG_GHUT-3	Whole	RG_GHFF-1	Whole ^c	RG_GHBP-5	1/2			
RG_GHUT-4	1/2	RG_GHFF-2	Whole	RG_GHBP-6	Whole ^c			
RG_GHUT-5	1/4	RG_GHFF-3	Whole	RG_GAUT-1	1/2			
RG_GHUT-6	1/8 ^d	RG_GHFF-4	Whole	RG_GAUT-2	1/2			
RG_GHNF-1	1/8	RG_GHFF-5	Whole	RG_GAUT-3	1/2			
RG_GHNF-2	1/4	RG_GHFF-6	1/4	RG_GAUT-4	1/2			
RG_GHNF-3	Whole	RG_GHP-1	1/4	RG_GAUT-5	Whole			
RG_GHNF-4	1/16	RG_GHP-2	1/8	RG_GAUT-6	1/2			
RG_GHNF-5	1/16	RG_GHP-3	1/2	RG_GANF-1	1/2			
RG_GHNF-6	1/16	RG_GHP-4	1/4	RG_GANF-2	1/2			
RG_GHDT-1	1/4	RG_GHP-5	Whole	RG_GANF-3	1/2			
RG_GHDT-2	1/2	RG_GHP-6	Whole c,e	RG_GANF-4	1/2			
RG_GHDT-3	Whole	RG_GHBP-1	1/2	RG_GANF-5	1/2			
RG_GHDT-4	Whole	RG_GHBP-2	1/2	RG_GANF-6	Whole			
Timed Kick Sa	mples (Cordiller	a Consulting)						
RG_GHNF-1	1/5	RG_GHNF-5	1/20	RG_GHDT-3	Whole ^c			
RG_GHNF-3	Whole	RG_GHDT-1	Whole	RG_GHDT-5	Whole			

Note: µm = micrometre.

^a Mesh sizes were 400 μm for all stations/samples except RG_GHP-1 through RG_GHP-6. These samples were collected from Greenhills Creek Sedimentation Pond and were sieved through a 500 μm mesh.

^b Algae portion of sample sorted to 1/16; remaining sample sorted to 1/4.

^c Two halves sorted for subsampling error calculations.

^d Two sixteenths sorted for subsampling error calculations.

^e Four quarters sorted for subsampling error calculations.

Table B.11: Percent Recovery of Benthic Invertebrates, September 2022

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery				
Area-based Samples	Area-based Samples (ZEAS Inc.)						
RG_GANF-6	183	190	96%				
RG_GHBP-6	378	396	96%				
RG_GHDT-1	81	84	96%				
RG_GHDT-5	135	145	93%				
RG_GHNF-5	215	230	94%				
RG_GHP-6	1,158	1,164	99%				
		Average % Recovery	96%				
Timed Kick Samples	Timed Kick Samples (Cordillera Consulting)						
QC Sample 1	322	331	97%				

Highlighted values did not meet the DQO of ≥90% (ZEAS Inc.) or ≥95% (Cordillera Consulting). Notes: % = percent; DQO = data quality objective; ≥ = greater than or equal to.

Table B.12: Calculation of Benthic Invertebrate Community Taxonomic Error, September 2022 ^a

Station	Taxa Identified	Error Rate (%)	Percent Difference in Enumeration (%)	Percent Taxonomic Disagreement (%)	Bray-Curtis Dissimilarity Index
Timed Kick Samples (Cordillera Consulting)					
RG_GHNF-3	346	0.00	0.28985507	0.57803468	0.00289855

Highlighted values did not meet the DQO of ≤5% or 0.05 for the Bray-Curtis Dissimilarity Index.

Notes: % = percent; DQO = data quality objective; ≤ = less than or equal to.

^a The number of significant digits reported in the table is consistent with the laboratory report.

B6 BENTHIC INVERTEBRATE TISSUE CHEMISTRY

B6.1 Laboratory Reporting Limits

Benthic invertebrate tissue chemistry samples collected in February and September 2022 were analyzed by TrichAnalytics Inc. (Trich). The analytical reports (Appendix C) were examined to provide an inventory of constituents for which the sample results were less than the LRL. Additionally, LRLs for selenium were assessed relative to the 4 milligram per kilogram dry weight (mg/kg dw) guideline for British Columbia (BCMOECCS 2021a) and the most conservative (i.e., lowest) EVWQP benchmark (i.e., the 11 μ g/g dw EVWQP Level 1 Benchmark for dietary effects to juvenile fish; Golder 2014).

All constituents except arsenic were detected in all samples collected in February and September 2022 (Appendix Table B.13). Specifically, arsenic was not detected in two (i.e., 7.1%) of the 28 benthic invertebrate tissue chemistry samples from September 2022. The LRLs for selenium were consistently less than the ENV/BCMOECCS guideline and the lowest EVWQP Level 1 Benchmark (Appendix Table B.13). Therefore, the achieved LRLs were considered appropriate for the study.

B6.2 Data Precision

Laboratory duplicate samples and recoveries of CRM (i.e., DORM-4, NIST-1566b, and NIST-2976) were used to assess laboratory precision (Appendix Table B.1; Appendix C). One and four laboratory duplicate samples were prepared and analyzed with the benthic invertebrate tissue chemistry samples collected in February and September 2022, respectively (Appendix C). All laboratory duplicate results met the DQO set by the analytical laboratory (Appendix Table B.1). The DQO for estimating precision of recoveries of CRM was set at a relative standard deviation (RSD) of ≤20%. Results were within the DQO (Appendix C). Therefore, laboratory precision for the benthic invertebrate tissue chemistry analyses completed by Trich are considered excellent and are of acceptable quality for this study.

B6.1 Data Accuracy

Data accuracy for the benthic invertebrate tissue chemistry samples was evaluated based on recoveries of CRM from four laboratory samples (i.e., one for February and three for September 2022; Appendix C). Each of the reported results for the four CRM samples met the DQO (Appendix Table B.1; see also Appendix C). Therefore, the accuracy achieved by analytical laboratory was considered excellent.

Table B.13: Laboratory Reporting Limit Evaluation for Benthic Invertebrate Tissue Chemistry Analyses, 2022

Constituent	Unito	LF	RLs a,b	No. Sample Results <lrl<sup>c</lrl<sup>		
Constituent	Units	February	September	February	September	
Aluminum (AI)	mg/kg dw	0.022	0.063 to 0.087	0	0	
Antimony (Sb)	mg/kg dw	0.047	0.003 to 0.004	0	0	
Arsenic (As)	mg/kg dw	0.366	0.398 to 0.431	0	2 (7.1%)	
Barium (Ba)	mg/kg dw	0.001	0.001	0	0	
Boron (B)	mg/kg dw	0.060	0.060 to 0.107	0	0	
Cadmium (Cd)	mg/kg dw	0.048	0.068 to 0.070	0	0	
Calcium (Ca)	mg/kg dw	14	3.1 to 6.1	0	0	
Chromium (Cr)	mg/kg dw	0.376	0.061 to 0.064	0	0	
Cobalt (Co)	mg/kg dw	0.004	0.014 to 0.019	0	0	
Copper (Cu)	mg/kg dw	0.004	0.018 to 0.029	0	0	
Iron (Fe)	mg/kg dw	0.454	0.795 to 0.801	0	0	
Lead (Pb)	mg/kg dw	0.002	0.001	0	0	
Lithium (Li)	mg/kg dw	0.002	0.019 to 0.022	0	0	
Magnesium (Mg)	mg/kg dw	0.015	0.062 to 0.078	0	0	
Manganese (Mn)	mg/kg dw	0.009	0.008	0	0	
Mercury (Hg)	mg/kg dw	0.023	0.022 to 0.027	0	0	
Molybdenum (Mo)	mg/kg dw	0.001	0.001	0	0	
Nickel (Ni)	mg/kg dw	0.038	0.001 to 0.052	0	0	
Phosphorus (P)	mg/kg dw	39	60 to 88	0	0	
Potassium (K)	mg/kg dw	1.2	2.4 to 2.8	0	0	
Selenium (Se)	mg/kg dw	0.431	0.375 to 0.579	0	0	
Silver (Ag)	mg/kg dw	0.001	0.001	0	0	
Sodium (Na)	mg/kg dw	1.1	4.6 to 5.7	0	0	
Strontium (Sr)	mg/kg dw	0.001	0.001	0	0	
Thallium (TI)	mg/kg dw	0.001	0.001	0	0	
Tin (Sn)	mg/kg dw	0.018	0.020 to 0.022	0	0	
Titanium (Ti)	mg/kg dw	0.125	0.001	0	0	
Uranium (U)	mg/kg dw	0.001	0.001	0	0	
Vanadium (V)	mg/kg dw	0.028	0.028 to 0.036	0	0	
Zinc (Zn)	mg/kg dw	0.353	0.216 to 0.230	0	0	

Shading indicates an LRL for selenium that is greater than the lowest applicable EVWQP Level 1 Benchmark (i.e., 11 µg/g dw) for dietary effects to juvenile fish (Golder 2014).

Shading indicates an LRL greater than the BCMOECCS interim selenium guideline for invertebrate tissue (4 µg/g dw; BCMOECCS 2021a).

Notes: LRL = Laboratory Reporting Limit; < = less than; mg/kg dw = milligrams per kilogram dry weight; % = percent; EVWQP = Elk Valley Water Quality Plan; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a The number of significant digits reported in the table is consistent with laboratory reports.

^b The LRLs for selenium were compared to the BCMOECCS interim guideline and EVWQP Level 1 Benchmark for dietary effects to juvenile fish (i.e., the most conservative benchmark); LRLs were consistently below guidelines/benchmarks. No other constituents had guidelines or EVWQP benchmarks for concentrations in benthic invertebrate tissues.

^c Total n = 4 samples in February 2022 and total n = 28 samples in September 2022.

B6.2 Data Quality Statement

Benthic invertebrate tissue chemistry data collected for this study are of acceptable quality as characterized by excellent detectability, laboratory precision, and laboratory accuracy. Therefore, the associated data can be used with a high level of confidence in the derivation of conclusions.

B7 OVERALL DATA QUALITY STATEMENT

Overall, the quality of the data collected in support of the 2022 GC LAEMP is considered acceptable for derivation of conclusions related to the study questions described in the main report.

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APPENDIX C WESTSLOPE CUTTHROAT TROUT



REPORT

Greenhills Creek 2022 Fish Population Monitoring

Submitted to:

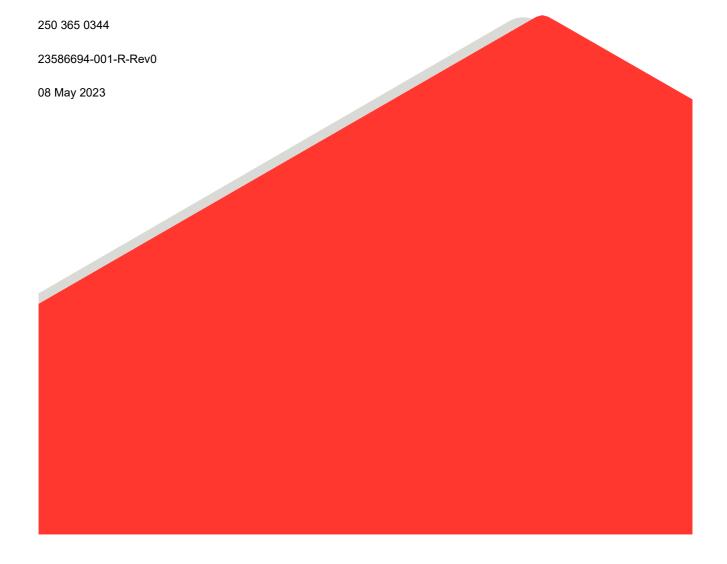
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Executive Summary

Greenhills Operations (GHO) is a steel-making coal mine operated by Teck Coal Limited (Teck) in the Fording River watershed in southeast British Columbia. Greenhills Creek is a tributary of the upper Fording River that is located in and adjacent to the southern portion of GHO. The Greenhills Creek sedimentation pond divides this tributary into two sections. Downstream of the pond, water flows down a spillway, through a decant channel, and through a culvert with a duckbill outlet into lower Greenhills Creek, which flows a further 0.58 km to the upper Fording River. Upper Greenhills Creek extends approximately 5 km upstream of the sedimentation pond and has a 2 km-long tributary called Gardine Creek.

The only fish species present in the Greenhills Creek watershed is Westslope Cutthroat Trout (WCT; Oncorhynchus clarkii lewisi). Lower Greenhills Creek is accessible to the population of WCT in the upper Fording River up to the fish barrier at the duckbill culvert. WCT in upper Greenhills Creek and Gardine Creek were originally part of the population in the upper Fording River but were isolated by the construction of the sedimentation pond in the early 1980s.

Monitoring of WCT in Greenhills Creek occurs as part of Teck's WCT monitoring program in the upper Fording River and other Teck monitoring programs such as the Greenhills Creek Local Aquatic Effects Assessment and Monitoring Program (LAEMP; formerly Greenhills and Gardine Creek Aquatic Effects Monitoring Program – GGCAMP). In 2022, data collection included spawning (redd) surveys, backpack electrofishing surveys to estimate juvenile densities, and night-time dip-net surveys to collect information about the size of age-0 WCT. WCT data collected in Greenhills Creek were analyzed as part of the overall population monitoring program for the upper Fording River. The objective of this report is to describe the 2022 fish population monitoring results specific to the Greenhills Creek watershed.

During the 2022 spawning surveys, redds were observed in lower and upper Greenhills Creek and Gardine Creek but the estimated total number of unique nests was low (*n*=9). Estimated densities of juvenile (age-1 and age-2+ less than 200 mm fork length) WCT were greater in lower Greenhills Creek and Gardine Creek than in upper Greenhills Creek. The inconsistent number and location of sites sampled each year made it difficult to assess temporal trends but the electrofishing data did not suggest any substantial changes or sustained trends in the density of age-1 or age-2+ WCT in upper Greenhills Creek, Gardine Creek, or lower Greenhills Creek.

The model-estimated mean length of age-0 WCT was larger in lower Greenhills Creek (64 mm) than all other monitored tributaries and portions of the upper Fording River watershed (23 to 53 mm). Age-0 WCT were not captured upstream of the sedimentation pond but age-1 WCT in upper Greenhills Creek were estimated to be smaller (50 to 89 mm) than those captured in lower Greenhills Creek (75 to 114 mm) based on visual examination of the data. The larger size of age-0 and age-1 WCT in lower Greenhills Creek, when compared to other monitored portions of the upper Fording River watershed, was attributed to higher water temperatures downstream of the Greenhills Creek sedimentation pond, as the number of degree-days during the growing season appears to be greater than nearly all other monitored portions of the upper Fording River watershed.

The length-at-age of age-2 and older WCT and the length-at-maturity are uncertain for WCT in Greenhills Creek and the upper Fording River population. These uncertainties currently limit or bias estimation of vital rates, which are egg deposition (spawning), growth, and survival. Monitoring methods that could help reduce uncertainties in population metrics and vital rates include: 1) scale ageing; 2) continued PIT-tagging to improve understanding of growth, movement, and survival; and, 3) recording the estimated size of spawners observed during spawning surveys to inform length-at-maturity.



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1.0 INTRODUCTION

Greenhills Operations (GHO) is a steel-making coal mine operated by Teck Coal Limited (Teck) in the Fording River watershed in the Elk Valley in southeast British Columbia. Greenhills Creek is a tributary of the upper Fording River that is located in and adjacent to the southern portion of GHO (Figure 1). Lower Greenhills Creek is the 0.6 km¹ section of the tributary between its confluence with upper Fording River and the culvert and spillway at the downstream end of the Greenhills Creek sedimentation pond. Upper Greenhills Creek is defined as the portion of the tributary upstream of the sedimentation pond.

The only fish species present in upper and lower Greenhills Creek is Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*), which is listed as a species of Special Concern provincially (Government of BC 2023) and under the federal Species-At-Risk Act (COSEWIC 2016). Lower Greenhills Creek is accessible to the population of Westslope Cutthroat Trout (WCT) in the upper Fording River, which is an isolated population upstream of Josephine Falls, a natural barrier to upstream fish movement. WCT are also present in the Greenhills Creek sedimentation pond and in upper Greenhills Creek and can move between these two habitats. Infrastructure at the outlet of the sedimentation pond includes a spillway that discharges water into a stilling basin (a 2 m deep concrete-walled portion of channel designed to dissipate energy; Minnow 2021). Downstream of the stilling basin, water flows through a culvert with a duckbill outlet that is intended to prevent upstream movement of WCT from lower Greenhills Creek (AJM 2022). Upper Greenhills Creek provides approximately 5 km of habitat for WCT upstream of the sedimentation pond (Cloutier et al. 2023) and Gardine Creek, a tributary of upper Greenhills Creek, provides an additional approximately 2 km of habitat (KNRC 2007). WCT in lower Greenhills Creek are considered part of the upper Fording River population whereas WCT upstream of the culvert/spillway barrier are considered an isolated population.

Monitoring of the upper Fording River WCT population has occurred in most years since 2012 (Cope 2020; Thorley et al. 2022a). A variety of sampling methods are used to collect data in the upper Fording River and in fish-bearing tributaries (Thorley et al. 2022b). In 2022, WCT data collection included sites in lower and upper Greenhills Creek and in Gardine Creek. Fish population data from the Greenhills Creek watershed are analyzed and included as part of the overall population monitoring program for the upper Fording River (Thorley et al. 2023b) but are not specifically highlighted or summarized in that program's annual report. The objective of this report is to describe the 2022 fish population monitoring results specific to the Greenhills Creek watershed. Where data from previous years are available, trends in the fish population over time are assessed.

A conceptual framework to guide monitoring and improve understanding of Teck's actions (i.e., mining-related activities as well as habitat compensation) on fish and fish habitat is currently in development (Thorley et al. in preparation). The framework describes the potential pathways of effect from actions to fish habitat, which can influence the vital rates of fish populations (growth, survival, reproduction, and movement), which in turn affect changes in the abundance of fish over time (i.e., the population dynamics). The framework includes 10 guiding questions regarding the biology of fish populations (Table 1). Information collected to answer these questions can be used to understand population characteristics, estimate vital rates, and provide inputs for modelling of population dynamics in the future. This report summarizes the 2022 fish population monitoring results in the Greenhills Creek watershed in terms of the 10 guiding questions.

wsp

¹ The stream network and river kilometres used in this report are based on Teck's GIS stream network

Table 1: Questions about the fish population that were used to frame the 2022 monitoring results.

Population Characteristics: Questions about the fish population that are relatively constant across years

- 1) What is the geographic range of the fish population?
- 2) What is the genetic diversity and effective genetic population size?
- 3) What are the life history strategies within the fish population?
- 4) What is the timing of life history events?
- 5) What are the sizes of the key life stages?

Vital Rates and Associated Endpoints: Questions about the fish population that can vary by year

- 6) What is the growth rate of key life stages?
- 7) What is the spatial distribution of key life stages?
- 8) What is the abundance of key life stages?
- 9) What is the total number of eggs deposited?
- 10) What is the survival of key life stages?

Note: Questions are from Teck's Fish Framework (Thorley et al., in preparation) and are described in Golder et al. (2022)



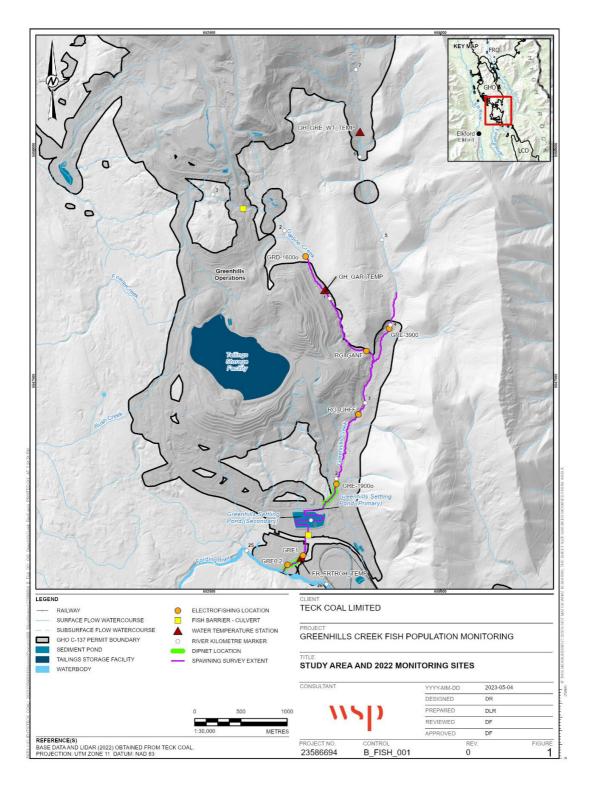


Figure 1: Map of study area and locations of fish population monitoring sites sampled in 2022.



2.0 METHODS

2.1 Overview

Data collection and analysis followed the study design for the 2022 upper Fording River WCT monitoring program (Thorley et al. 2022b). Alignment with the WCT population monitoring standards and protocols in 2021 and 2022 allows for comparability with other Teck Coal regional fish monitoring programs. Data were collected as part of the upper Fording River WCT program and other Teck monitoring programs such as the Greenhills Creek Local Aquatic Effects Assessment and Monitoring Program (LAEMP; formerly Greenhills and Gardine Creek Aquatic Effects Monitoring Program – GGCAMP). Data collection in the Greenhills Creek watershed in 2022 included a spawning survey, backpack electrofishing, a night-time dip-net survey, and snorkeling observations near infrastructure downstream of the sedimentation pond (Table 2). Spawning surveys were used to estimate the total number of nests and assess the timing and locations of spawning. Backpack electrofishing was used to estimate the densities of juvenile fish including age-1 and age-2+ life stages. The age-2+ life stage refers to fish from age-2 (i.e., third year of life) until they reach the adult body form, which was assumed to be at a fork length of 200 mm. Night-time dip-net surveys were used to target age-0 fish.

Downstream snorkel surveys are used to enumerate adult WCT in the upper Fording River and selected larger tributaries (Thorley et al. 2022b). Greenhills Creek is not typically included in these downstream snorkel survey because of its shallow depth; however, one exception was that in 2022, the plunge pool at the outlet of the duckbill culvert in lower Greenhills Creek was snorkeled during the survey. In addition, visual observations and counts of WCT in the duckbill plunge pool and in the stilling basin and decant channel between the culvert and spillway were conducted as part of effectiveness monitoring. A summary of snorkeling and visual observations in these areas is included in this report.

Results in this report focus on the 2022 monitoring year, but data from previous study years were included where possible to assess recent trends over time. Historic data will continue to be incorporated into the standardized database and will be included in future analyses when possible.

Table 2: Summary of fish monitoring methods used in Greenhills Creek in 2022.

Method	Type of Data and Life Stage Targeted	Location
Spawning (redd) survey	Number of redds/nests, and timing and location of spawning by mature adults	 0.6 km of lower Greenhills Creek 2.8 km of upper Greenhills Creek 1.6 km of Gardine Creek
Backpack electrofishing survey	Abundance of juvenile fish (age-1 and age 2+)	 Three small, closed locations (GRE1 [RG_GHBP]*, RG_GHFF, and RG_GANFF) Three large, open sites (GRE0.2 [GH_GH2]*, GRE-1900o, and GRD-1600o [RG_GAUT]*) One closed site from a fish salvage (GRE-3900)

Method	Type of Data and Life Stage Targeted	Location
Night-time dip-net survey	Size of age-0 fish near the end of the growing season	■ Lower and upper Greenhills Creek
Snorkeling and visual observations	Number of juvenile, subadult, and adult fish	 Plunge pool at the outlet of the duckbill culvert (during effectiveness monitoring of the duckbill and during the upper Fording River WCT snorkel survey) Stilling basin and decant channel between culvert and spillway from sedimentation pond (during effectiveness monitoring)

^{*} Site names in brackets refer to the corresponding site name from the LAEMP or GGCAMP at the same location

2.2 Spawning (Redd) Survey

Redds are disturbances in the gravel due to spawning activity. Redds may contain multiple nests where fish deposit eggs. Spawning surveys are conducted to count the number of nests and the data are used to estimate the total number of nests, as well as the timing and spatial distribution of spawning. In 2022, spawning surveys were conducted approximately weekly in the Greenhills Creek watershed between early June and early August. Areas surveyed were the entire 0.6 km of lower Greenhills Creek, the 2.8 km of upper Greenhills Creek upstream of the sedimentation pond (from river kilometre 1.3 to 3.1), and 1.6 km of Gardine Creek. Spawning survey data from 2021 are also included in this report.

Spawning surveys followed Teck's standard protocol for monitoring spawning near Teck sites (Smit et al. 2022). Spawning surveys were conducted by a crew of two observers walking in an upstream direction with one observer on each bank. All suitable spawning gravels were visually inspected for spawning-related disturbances. A single nest or aggregation of nests was considered a redd. Each nest was classified as "definitive", which are nests with a distinct pit upstream of a loose mound of clean pebbles and gravels, or "potential", which includes test digs by females to evaluate the substrate, or older nests that are no longer distinct. For each redd, the time, spatial coordinates, number of potential and definitive nests within the redd, and the number of adult fish associated with the redd were recorded. Data recorded regarding sampling effort and conditions included the following:

- date and time of the start and end of the survey
- GPS coordinates of the start and end location of the survey
- water temperature and turbidity at the start and end location of the survey
- estimated length of stream that could not be sampled

2.3 Backpack Electrofishing Survey

Backpack electrofishing is the primary method used to monitor the abundance of juvenile fish (age-1 and age2+). Two types of electrofishing surveys were conducted: removal-depletion at small, closed sites, and mark-recapture at large, open sites. Removal-depletion at small, closed sites was used in previous years between 2013 and 2021

during the LAEMP/GGCAMP program. Mark-recapture at large, open sites began in 2021 to address potential bias and limitations of the previous method. Small, closed sites were index sites that were sampled in consecutive years whereas the locations of large, open sites were randomly selected each year using a stratified approach. For both types of electrofishing, a single electrofishing pass was conducted at all sites, with additional passes conducted at a subset of sites to allow estimates of capture efficiency and therefore absolute abundance. Capture efficiency was estimated using removal-depletion for small, closed sites and mark-recapture methods for large, open sites. The combination of two electrofishing methods used in 2021 and 2022 allows comparison to previous years of data that used only small, closed sites, while reducing bias by sampling a greater portion of the study area with large, open sites.

In 2022, backpack electrofishing was conducted in Greenhills Creek watershed on 24 August and 1 and 2 September (Table 3). Methods for the two types of electrofishing followed Teck's protocol (Thorley et al. 2022c) and are summarized below. In the analysis, backpack electrofishing data from 2013 to 2022 were used.

Table 3: Summary of electrofishing sites sampled in 2022.

Stream	Site Name	LAEMP / GGCAMP Site Name	Location (km²)	Date Sampled	Site Type	Number of Passes	Site Length (m)	Average Site Width (m)
Lower Greenhills	GRE0.2	GH_GH2	0.120	24 August	Open	1	293	1.5
Lower Greenhills	GRE1	RG_GHBP	0.315	2 September	Closed	1	100	1.0
Lower Greenhills	GRE1	RG_GHBP	0.315	2 September	Closed	1	24	2.0
Lower Greenhills	GRE1	RG_GHBP	0.315	2 September	Closed	1	38	3.0
Upper Greenhills	GRE-1900o	n/a	1.930	1 September	Open	2	295	2.9
Upper Greenhills	RG_GHFF	RG_GHFF	2.845	1 September	Closed	2	40	3.0
Upper Greenhills	RG_GHFF	RG_GHFF	2.845	2 September	Closed	2	35	3.0
Upper Greenhills	RG_GHFF	RG_GHFF	2.845	2 September	Closed	2	45	3.0
Upper Greenhills	GRE-3900 ^b	n/a	3.955	22 August	Closed	1	25	3.0
Gardine	RG_GANF	RG_GANF	0.190	1 September	Closed	2	50	2.0
Gardine	RG_GANF	RG_GANF	0.190	1 September	Closed	2	60	2.0
Gardine	RG_GANF	RG_GANF	0.190	1 September	Closed	2	50	2.0
Gardine	GRD-1600o	RG_GAUT	1.585	1 September	Open	2	292	0.7

a. km refers to the distance upstream from the tributary mouth.

b. Site GRE-3900 was a fish salvage site that was not part of the small, closed sites from the upper Fording River WCT population monitoring program. Data from the first electrofishing pass from this salvage site were used in this report.



2.3.1 Removal-Depletion at Small Closed Sites

Three small, closed sites were sampled in 2022. The sites sampled were GRE1 in lower Greenhills Creek, GHFF in upper Greenhills Creek, and RG_GANFF in Gardine Creek. At each of the three sites, three single mesohabitat units (pool, riffle, glide, or cascade) of approximately 10 to 35 m in length (approximately 100 m² in wetted area) were sampled. Mesohabitats were isolated (closed) using stop nets at the upstream and downstream boundaries. Within each mesohabitat, all habitat was sampled by a crew of three, including one operator, one active netter with a dip-net, and a second, passive netter using a pole seine. Each electrofishing pass started at the downstream net and moved upstream in a systematic bank to bank sweep.

For the overall upper Fording River WCT monitoring program, the approach was to conduct an initial single electrofishing pass at all the mesohabitats (three per site), an additional second pass at a randomly selected subset of sites, and a third pass at a randomly selected subset of sites. In the Greenhills Creek watershed, one pass was conducted at GRE1 and two passes were conducted at RG GANFF and RG GHFF.

Captured fish were held in a dark-coloured bucket with fresh aerated stream water until all electrofishing passes and fish processing were complete. Fish were released in slow velocity habitat in their capture site. The total number of fish observed but not captured was also recorded for each pass.

In addition to the small, closed sites described above, data from a fish salvage at site GRE-3900 were used in the analyses. Only data from the first electrofishing pass of the salvage were used. As the site was isolated using block nets, the site was considered a closed site, but only one 25 m by 3 m area was fished and not three mesohabitats like in the closed sites for population monitoring.

2.3.2 Mark-Recapture at Large Open Sites

Electrofishing of large, open sites was used to increase the proportion of the accessible habitat sampled by electrofishing. The method consisted of a single open (without stop nets) pass at long (approximately 300 m) sites. Sites were selected using stratified random sampling. To ensure all tributaries and segments of interest were sampled, the following strata were used:

- Lower Greenhills Creek (known as Reach 1)
- Upper Greenhills Creek (reaches 3 and 4 combined)
- Gardine Creek

One large open site from each of these strata was randomly selected in 2022. The selected sites were the following:

- GRE-100o in lower Greenhills Creek, located 0.1 km from the confluence with the upper Fording River, which was in a similar location as GRE0.2, which was sampled in previous years
- GRE-1900o in upper Greenhills Creek, located 1.9 km upstream from the confluence with the upper Fording River
- GRD-1600o in Gardine Creek, located 1.6 km from its confluence with upper Greenhills Creek



During electrofishing passes, three crew members (one operator, one active netter with a dip-net, and one passive netter with a pole seine) sampled in an upstream direction starting at the downstream end of the site. The fourth and fifth crew members processed captured fish while the rest of the crew electrofished and recorded data, including the start and end locations and times, and the locations and times of all captured fish. This method of processing while sampling and recording individual fish locations has several advantages, including the following:

- It provides data regarding the fine-scale distribution of fish in each section
- Fish can be released close to (within approximately 5 m of) their capture location, which may reduce stress and the chance of displacement of fish

In addition to captured fish, the total number of fish observed but not captured was recorded. Fish processing and data collection was the same as for small, closed sites, as described in the section below.

At a subset of randomly selected sites in the upper Fording River watershed, a second pass was conducted on the following day to allow estimation of capture efficiency from data from recaptured fish (Section 2.7.7). In the Greenhills Creek watershed, one pass was conducted at GRE0.2 (GRE-1000) and two passes were conducted at GRE-19000 and GRD-16000.

2.3.3 Fish Processing

Fish processing followed the protocol (Thorley et al. 2022c) and the 2022 study design (Thorley et al. 2022b). All captured fish were measured for fork length to the nearest 1 mm, weighed to the nearest 0.1 g, scanned for a Passive Integrated Transponder (PIT) tag (if larger than 99 mm), and photographed. A PIT tag was inserted into all uninjured fish greater than or equal to 100 mm. Fish were inspected for any deformities, erosion, lesions, or tumours (DELT) and the information was recorded using the DELT categories and scale from Ings and Weech (2020), which is consistent with the methods in the study design for the 2021 to 2023 Regional Aquatics Effects Monitoring Program. Processed fish were allowed to recover before being released as close to their capture location as possible, preferably near cover and in slow moving water.

2.4 Night-Time Dip-Net Survey

Due to their small size and patchy distribution, age-0 WCT are rarely caught during fall backpack electrofishing surveys. The size of age-0 WCT has been linked to overwintering survival, particularly in cold, headwater streams (Coleman and Fausch 2007a, 2007b). Age-0 fish in the stream margins were captured using hand nets during the dip-net surveys to gather information on the size of age-0 WCT near the end of the growing season. Age-1 fish in stream margins were not the main target but were occasionally captured. In addition to information about size-at-age, the surveys provided limited information on the spatial distribution of age-0 and age-1 fish (occupancy but not relative density).

The dip-net survey was conducted in lower Greenhills Creek on October 13, 2022 (Figure 1). The location and estimated body length were recorded for all observed WCT. Fish approximately 100 mm or less were captured using a hand net where possible and were measured and photographed before being released at their location of capture. A subset of five fry were weighed to the nearest 0.01 g.

The measured lengths of captured age-0 fish and the estimated lengths of observed age-0 fish were used in the length-at-age analyses (Section 2.7.4). The relationship between water temperature and the size of age-0 WCT will be presented in a separate report (Brooks et al. in preparation).

2.5 Snorkeling and Visual Observations

Downstream snorkel surveys were used to enumerate adult WCT in the upper Fording River and selected larger tributaries from 2012 to 2022. Historically, snorkel surveys were not conducted in Greenhills Creek, but in 2022 the plunge pool at the outlet of the duckbill culvert was assessed while conducting the downstream snorkel survey for the upper Fording River WCT monitoring program. Data from the plunge pool were not included in the analysis of downstream snorkel data for the analysis in the upper Fording River WCT monitoring program but are included in this report.

Effectiveness monitoring of the duckbill culvert fish barrier was conducted on 16 occasions between October 2020, when the duckbill culvert outlet was installed, and September 2022 (AJM 2022). Objectives of effectiveness monitoring were to assess the following: 1) fish presence/absence within or adjacent to GHO infrastructure; 2) habitat conditions in Greenhills Creek at the duckbill outlet; and 3) general condition and functionality of the duckbill. Data included in this report are the counts of WCT from snorkeling and stream-side visual observations in the plunge pool of the duckbill culvert outlet and in the Greenhills sedimentation pond decant channel, stilling basin, and a naturalized section of stream located between the spillway and culvert.

Although the plunge pool appears to provide habitat for a substantial number of WCT (AJM 2022), this area has not typically been sampled as part of the upper Fording River population monitoring program. Therefore, counts of WCT from the downstream snorkel survey and effectiveness monitoring were included in this report as an indicator of fish abundance in this portion of Greenhills Creek.

2.6 Water Temperature

Water temperature data from three stations were used in this report (Figure 1), including one station in lower Greenhills Creek (FR_FRTRGH), one station in upper Greenhills Creek (GH_GAR), and one station in Gardine Creek (GH_GAR). Water temperature data were summarized to support the interpretation of fish population data, as water temperature is known to influence vital rates (e.g., growth and survival) of WCT in the upper Fording River watershed (Evaluation of Cause Team 2021). Water temperature data were used to calculate the growing season degree-days (GSDD) as described in Brooks et al. (2022). As in Coleman and Fausch (2007a), the start of the growing season was defined as "the beginning of the first week that average stream temperatures exceeded and remained above 5°C for the season" and the end of the growing season was defined as "the last day of the first week that average stream temperature dropped below 4°C". GSDD was calculated as the sum of daily average temperatures during the growing season.



Water temperature data were not available for the entire growing season at any of the three stations. At the station in lower Greenhills Creek (FR_FRTRGH), only the last few days of the growing season were missing and the missing data were estimated using linear extrapolation based on the relationship between local air temperature² and available water temperature data at this station. For the other two stations, data from a significant portion of the growing season were missing so GSDD was not estimated. Because GSDD could not be estimated at two of three stations, the mean water temperature during August was used as an additional metric to compare growing conditions between areas of the Greenhills Creek watershed.

2.7 Data Analysis

Data compilation and analysis were completed as part of the upper Fording River WCT monitoring program by Poisson Consulting Ltd. Methods are summarized here and additional details are provided in the online analytic appendix (Thorley et al. 2023a). All monitoring summarized for Greenhills Creek is in alignment with the WCT population monitoring program in 2021 and 2022 and Teck's regional fish monitoring standards and protocols to allow for comparability between locations.

2.7.1 Data Preparation

The historical (pre-2020) fish population data were provided to Poisson Consulting Ltd. by Teck Coal Ltd. as an assortment of Excel spreadsheets and shape files. The 2020 and 2021 field data were provided by Lotic Environmental Ltd. as Excel spreadsheets, gpx files, and kmz files, and by Ecofish Research Ltd. as Excel spreadsheets. The 2022 data were provided by Teck Coal Ltd. as geodatabase files from Teck's internal fish database. A spatial layer of the stream network was also provided by Teck as a geodatabase. All available years of data were extracted and cleaned (i.e., checked for errors and corrected if possible) and tidied (i.e., manipulated into a consistent format) before being stored in a purpose-built SQLite database using R version 4.2.2 (R Core Team 2022).

2.7.2 Statistical Analysis

Model parameters were estimated using Bayesian methods. The estimates were produced using JAGS (Plummer 2003) and STAN (Carpenter et al. 2017; Thorley et al. 2022b). For additional information on Bayesian estimation, the reader is referred to McElreath (2020). Unless stated otherwise, the Bayesian analyses used weakly informative normal and half-normal prior distributions (Gelman et al. 2017). The posterior distributions were estimated from 1,500 Markov Chain Monte Carlo (MCMC) samples thinned from the second halves of three chains (Kery and Schaub 2011). Model convergence was confirmed by ensuring that the potential scale reduction factor, \hat{R} , was \leq 1.05 (Kery and Schaub 2011) and the effective sample size (Brooks et al. 2011), ESS, was \geq 150 for each of the monitored parameters (Kery and Schaub 2011).

² Daily, local air temperatures were obtained from https://daymet.ornl.gov/



The parameters are summarised in terms of the point estimate, lower and upper 95% compatibility limits (CLs) (Rafi and Greenland 2020) and the surprisal s-value (Greenland 2019). The estimate is the median (i.e., 50th percentile) of the MCMC samples while the 95% CLs are the 2.5th and 97.5th percentiles. The range between the upper and lower CL is referred to as the compatibility interval (CI).

The results are displayed graphically by plotting the modeled relationships between an explanatory variable and the response variable with the remaining variables held constant. In general, continuous and discrete fixed variables are held constant at their mean and first level values, respectively, while random variables are held constant at their average values (expected values of the underlying hyperdistributions) (Kery and Schaub 2011).

The analyses were implemented using R version 4.2.2 (R Core Team 2022) and the mbr family of packages.

For the purposes of data analysis, the term subpopulation refers to a subgroup of the WCT population in the upper Fording River (Thorley et al. 2023b). Subgroups are defined for different sections of streams. The sections were chosen to identify groups of fish that can be treated as having similar growth, survival, reproduction and/or movement for modeling purposes based on the current understanding of habitat (physical, chemical, and biological). As such, the subpopulation reflect life stage(s) and vital rate(s) under consideration as well as the presence of fish barriers and available data. For Greenhills Creek, upper Greenhills Creek and Gardine Creek were considered a single subpopulation and lower Greenhills Creek was a subpopulation.

2.7.3 Spawning (Redd) Survey

2.7.3.1 Redd Fading

In 2021, a subset of redds in the upper Fording River watershed were flagged and their visibility in subsequent surveys that year was recorded. These data were used to estimate the number of days until 50% of redds/nests had become invisible based on an exponential model. The time period when redds/nests remained visible was subsequently used to estimate the total expected nest count in a particular area each year (Section 2.7.3.2).

The key assumption of the redd fading model is the following:

■ The daily probability of fading is constant.

2.7.3.2 Nest Count

To estimate the total number of unique nests in each year and stream segment, the nest counts were analyzed using a hierarchical Bayesian Area-Under-the-Curve (AUC) model (Hilborn et al. 1999; Su et al. 2001).

Key assumptions of this nest count model include the following:

- Nest count varies randomly by segment within stream within year.
- Spawning activity (i.e., the timing of spawning) is normally distributed.
- Nests are visible for approximately 19 days.
- The variation around the expected nest count is normally distributed.



2.7.4 Length-at-Age

The lengths of age-0 fish in the upper Fording River watershed were analyzed using a generalized linear mixed effects model. The analysis used all age-0 fish captured by electrofishing and night-time dip-net surveys.

Key assumptions of the length-at-age model include the following:

- Fork length varies by day of the year of capture.
- Fork length varies randomly by subpopulation and year.
- The residual variation in the fork lengths is as described by student's t distribution truncated at 18 mm.
- The standard deviation of the normal component of the residual variation varies by observation vs capture.

Preliminary analysis indicated that observation vs capture was not an informative predictor of fork length.

2.7.5 Body Condition

For fish captured by electrofishing, the length and weight data for individuals between 90 and 169 mm were analyzed using a weight-length model (He et al. 2008). The model was based on the allometric relationship, $W = \alpha L^{\beta}$, where W is the weight (mass), α is the coefficient, β is the exponent, and L is the fork length. The relationship was transformed using the natural logarithm to linearize the relationship, resulting in the equation: $\log(W) = \log(a) + b \times \log(L)$.

Key assumptions of the condition model include the following:

- \bullet α can vary randomly by year, subpopulation and subpopulation within year.
- The residual variation in weight is log-normally distributed.

Preliminary analysis indicated that day of the year was not an informative predictor of α .

Results of the body condition analysis were plotted in terms of the percent change in the predicted body weight of a 100 mm fish relative to a typical subpopulation in typical year.

2.7.6 Length Frequency

Length frequency histograms were used to visualize the size structure of WCT captured by electrofishing and to help identify length cutoffs between life stages. Length cutoffs were identified visually from the histograms using professional judgement. It was assumed that age-0, age-1, and age-2+ could be identified by non-overlapping length distributions in the histograms. All fish greater than or equal to 200 mm in fork length were considered a single life stage grouping consisting of both subadult and adult fish. All fish greater than the maximum length of age-1 fish and less than 200 mm were considered age-2+.



Data from 2013 to 2022 were used in the analysis. For plotting purposes, data were grouped for the period before (2013 to 2017) and after (2019 to 2022) the large decrease in the abundance of subadult and adult WCT that occurred in the upper Fording River between 2017 and 2019 (Evaluation of Cause Team 2021).

2.7.7 Density

The electrofishing data were analyzed using a hierarchical Bayesian removal model (Wyatt 2002). The model estimated capture efficiency using removal-depletion data from the subset of small, closed sites that received more than one electrofishing pass. Capture efficiency was used in the model to estimate the absolute density of fish at each site. Density was estimated separately for the age-1 and age-2+ life stages. Densities were calculated per unit of stream length (lineal density) instead of per unit of area (areal density). Lineal density is preferred over areal density because fish are typically concentrated in specific parts of the stream cross-section rather than evenly distributed throughout the area, which makes fish densities better described by length rather than area. Additionally, area-based densities will fluctuate with stream discharge, whereas lineal based densities do not.

For the purpose of estimating changes in density over time, the subpopulations were assigned to one of three groupings: mainstem, tributary, and below-pond tributary (lower Greenhills, Lake Mountain, Fish Ponds, and lower Henretta creeks). This was done to allow overall comparisons of mainstem and tributary habitats and to allow temporal trends to differ between the three subpopulation groupings.

Key assumptions of the density model include the following:

- Lineal density varies by subpopulation grouping.
- Lineal density varies randomly by year, subpopulation, location, and subpopulation grouping within year.
- The number of fish at each site in each year is described by an over-dispersed Poisson distribution.
- The capture efficiency varies with the electrofishing effort, subpopulation grouping and method.
- The catch on each pass is binomially distributed.

3.0 RESULTS

3.1 Spawning (Redd) Survey

In 2022, 11 definitive nests were observed, of which 5 were in lower Greenhills Creek, 5 were in upper Greenhills Creek, and 1 was in Gardine Creek (Table 4). In 2021, 47 nests were observed in lower Greenhills Creek, while only 2 were observed in upper Greenhills Creek and none were observed in Gardine Creek. Few definitive nests were observed in 2020 with 3 counted in upper Greenhills Creek and 2 counted in lower Greenhills Creek. In the three years combined, the spatial distribution of definitive nests showed that spawning occurred throughout lower Greenhills Creek and was limited to a short section of upper Greenhills Creek, 2.4 to 3.0 km upstream of the stream's confluence with the upper Fording River (Figure 2). The single definitive nest observed in Gardine Creek was located approximately 200 m upstream from the confluence with upper Greenhills Creek.

Based on the redd fading model using data from the upper Fording River, 50% of redds/nests would no longer be visible after 18.8 days (CI: 14.4–24.8 days).



Table 4: The total number of definitive nests counted across all surveys by year and stream.

Year	Lower Greenhills Creek	Upper Greenhills Creek	Gardine Creek
2020	2	3	-
2021	47	2	0
2022	5	5	1

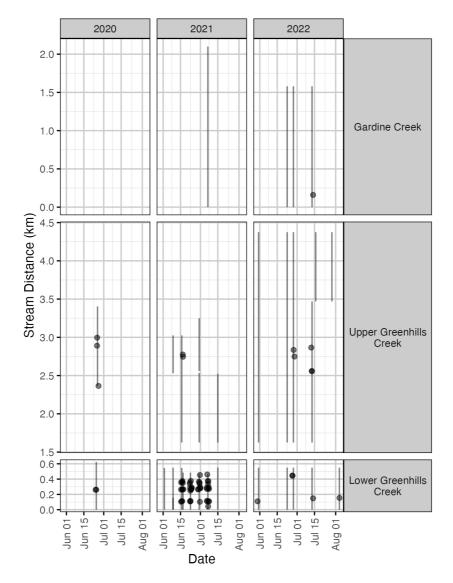


Figure 2: Definitive nests in Greenhills and Gardine Creek by stream distance, date, and year. Visits are indicated by vertical lines. Points are partially transparent and jittered to better convey information on density.



Because of the single survey date and different methods used in 2020, only data from 2021 and 2022 were used to assess the timing of spawning and to estimate the total count of unique nests. The timing of spawning was similar between subpopulations and years (2021 and 2022), with most nests observed between mid-June and mid-July. Spawning continued later in many of the tributaries, including Greenhills Creek, when compared to the upper Fording River (Figure 3). Based on the AUC model (Figure 3), the estimated expected total count of unique nests in lower Greenhills Creek was 8 in 2022 and 20 in 2021 (Figure 4). The estimated total count of unique nests in lower Greenhills Creek was similar to the estimate for LCO Dry Creek and Porter Creek but lower than the estimate for Chauncey Creek and Fish Pond Creek. In upper Greenhills Creek and Gardine Creek, there were not enough nest data to estimate the total expected unique nest count using the AUC model.

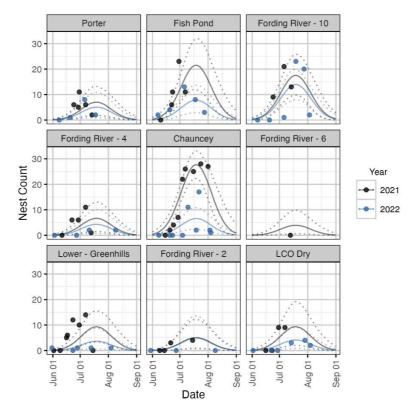


Figure 3: Daily nest counts by date, year, stream, and stream segment. Solid lines show the predicted counts from the AUC model with 95% CIs (dotted lines). Upper Greenhills and Gardine creeks were not included in the AUC model because of insufficient data.

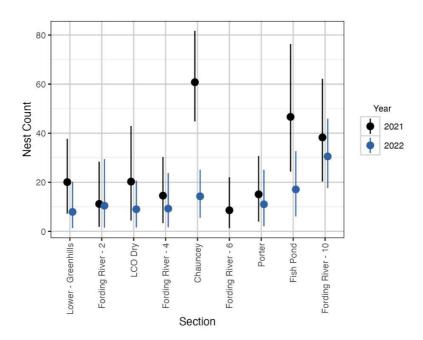


Figure 4: The estimated total unique nest count (with 95% CIs) by stream and year.

3.2 Body Condition

Weight-length relationships were similar among subpopulations in the upper Fording River watershed (Figure 5). Based on these relationships, the predicted weight of a 100 mm WCT was used to estimate the percent difference in body condition between subpopulations in a typical year (Figure 6). The estimated body condition of WCT in upper and lower Greenhills Creek was within the range of values from other areas in the upper Fording River watershed. The estimated body condition of WCT in lower Greenhills Creek (-1%, CI: -5% to 2%) was less than than in upper Greenhills Creek and Gardine Creek (1%, CI: -2% to 6%) but the difference was small (i.e., 2%) and highly uncertain. As the expected size of a 100 mm WCT is approximately 10 g (Figure 5), a 2% increase would represent an increase from 10 to 10.2 g.

The estimated body condition by year in upper Greenhills Creek and Gardine Creek decreased from 9% in 2017 to -6% in 2021, followed by an increase to 5% in 2022 (Figure 7). A similar trend was observed in lower Greenhills Creek with a decrease from 3% in 2017 to -6% in 2020, followed by an increase to -2% in 2021 and 1% in 2022.

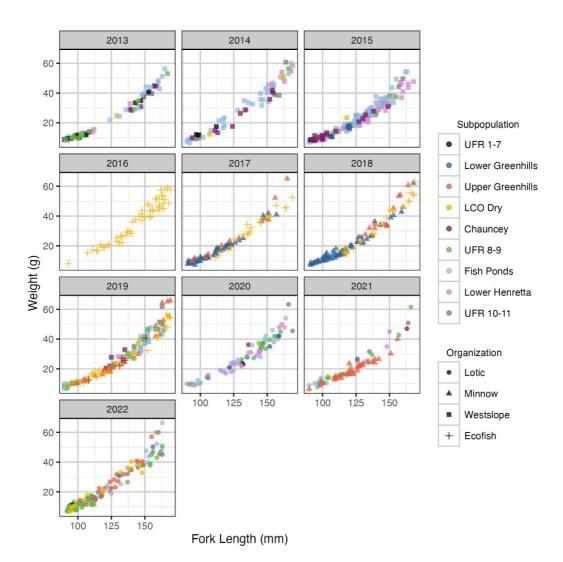


Figure 5: Weight by fork length of Westslope Cutthroat Trout by subpopulation (panel), year (point colour), and organization that collected the data (point shape). Subpopulations are different locations within the upper Fording River (UFR) watershed. The panel for upper Greenhills Creek also includes data from Gardine Creek.

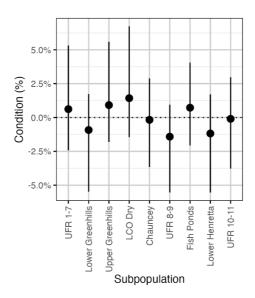


Figure 6: Body condition, shown as the percent change in the body weight of a 100 mm fish in a typical year relative to a typical stream by subpopulation (with 95% CIs). Subpopulations are different locations within the upper Fording River (UFR) watershed.

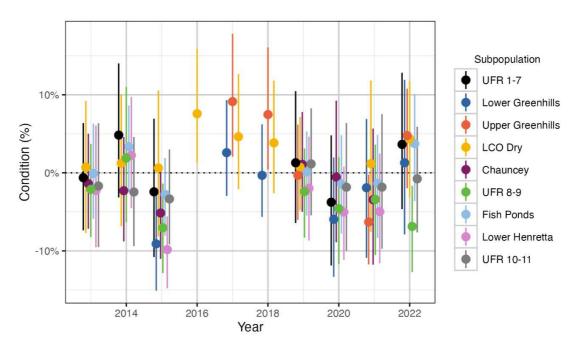


Figure 7: Body condition, shown as the percent change in the body weight of a 100 mm fish relative to a typical stream in a typical year by year and subpopulation (with 95% CIs). Subpopulations are different locations within the upper Fording River (UFR) watershed.

3.3 Length Frequency

Size structure of the catch and length-at-age cutoffs for WCT differed between upper and lower Greenhills Creek. In lower Greenhills Creek, age-0 WCT were less than 75 mm, and age-1 WCT ranged from 75 to 114 mm (Figure 8; Table 5). Age-0 and age-1 fish were larger in lower Greenhills Creek than most other subpopulations.

In upper Greenhills Creek and Gardine Creek, it was assumed that the first mode in the length frequency histogram represented age-1 WCT (50 to 89 mm) and that age-0 WCT were not captured. This suggests that age-1 WCT were smaller in upper Greenhills Creek and Gardine Creek than most other subpopulations in the upper Fording River and its tributaries, with the exceptions of LCO Dry Creek and Chauncey Creek, which the data suggest had similar sized age-1 WCT (Figure 8).

Length frequency data did not suggest a difference in length-at-age between the periods before and after the population decline that occurred between 2017 and 2019 (Figure 8).

Table 5: Length cutoffs for life stages of WCT in Greenhills Creek.

Section	Life Stage	Fork Length
Lower Greenhills Creek	Age-0	< 75 mm
Lower Greenhills Creek	Age-1	75–114 mm
Lower Greenhills Creek	Age-2+	114–199 mm
Lower Greenhills Creek	Subadult and adult	≥ 200 mm
Upper Greenhills Creek and Gardine Creek	Age-0	< 50 mm
Upper Greenhills Creek and Gardine Creek	Age-1	50–89 mm
Upper Greenhills Creek and Gardine Creek	Age-2+	90–199 mm
Upper Greenhills Creek and Gardine Creek	Subadult and adult	≥ 200 mm



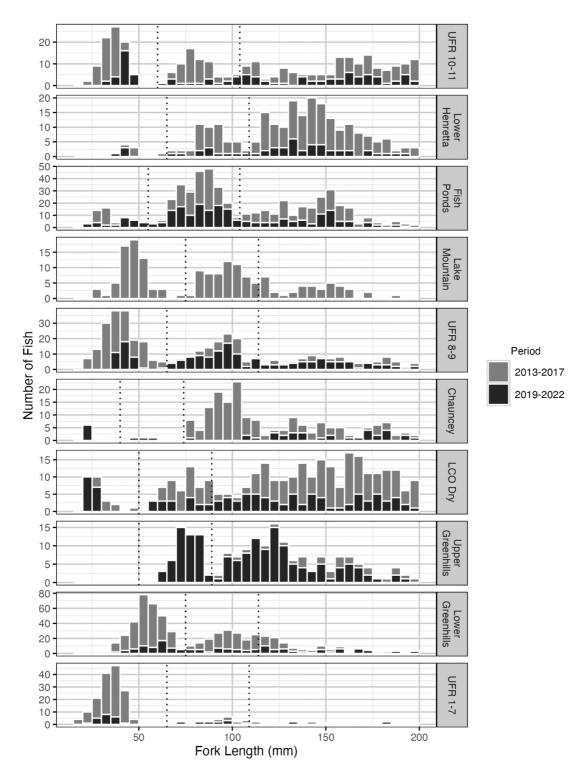


Figure 8: Number of fish captured by electrofishing by fork length, subpopulation, and period. Colour of bars represents the period before or after the decrease in counts of WCT during snorkel surveys that occurred between 2017 and 2019. The vertical dotted lines indicate the age-1 life stage cutoffs.

3.4 Length-At-Age

The estimated length of age-0 fish was greater in lower Greenhills Creek (64 mm, CI: 56–74 mm) than all other subpopulations of the upper Fording River watershed. In other subpopulations, estimated mean length ranged from 23 to 53 mm. Age-0 WCT were not captured in upper Greenhills Creek or Gardine Creek during electrofishing or the night-time dip-net survey.

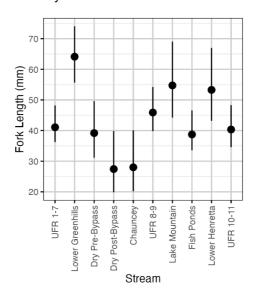


Figure 9: Estimated fork length of age-0 Westslope Cutthroat Trout on 01 October in a typical year by subpopulation within the upper Fording River watershed (with 95% CIs).

3.5 Density

The number of fish captured during the first electrofishing pass by site and year was used to assess general trends in catch over time (Figure 10). In the Greenhills Creek watershed, WCT were captured on the first pass at 5 of 7 sites in 2022. At sites in the Greenhills Creek watershed that were sampled in multiple years (GRE1, RG_GHFF, and RG_GANF), catches from 2022 were comparable to most previous years. Although the number of sites was small and not consistent across years, the data do not suggest any substantial or sustained change in density over time in Gardine Creek, upper Greenhills Creek, or lower Greenhills Creek.

During all years, age-1 WCT were rarely captured in sites in upper Greenhills Creek but were more common in Gardine Creek and lower Greenhills Creek (Figure 10). Age-2+ WCT were captured in all three of these sections (upper Greenhills, lower Greenhills, and Gardine creeks) in all years sampled. Although capture densities were lower in lower Greenhills Creek than in upper Greenhills and Gardine creeks in 2022 (Figure 10), these capture densities do not include WCT in the plunge pool of the duckbill culvert flowing into lower Greenhills Creek (Figure 1), where snorkeling and visual surveys indicated a substantial number of WCT were observed between mid-August and early September (Table 8).

Information from removal-depletion surveys was used to estimate capture efficiency, which allowed estimates of absolute density and abundance by life stage (age-1 and age-2+; Figure 11). Estimated densities by subpopulation for a typical year showed greater densities in lower Greenhills Creek than upper Greenhill Creek (including Gardine Creek; Figure 11). Estimated density by subpopulation groupings (Figure 12) indicated that the greatest densities were in tributaries that were downstream of ponds (age-1: 67 fish/100 m; age-2: 50 fish/100 m), followed by mainstem subpopulations in the upper Fording River (age-1: 17 fish/100 m; age-2: 16 fish/100 m), and the lowest densities were in tributaries without or upstream of ponds (age-1: 2 fish/100 m; age-2: 8 fish/100 m).

Estimated densities of age-1 WCT by site for a typical year were greater in lower Greenhills Creek (6–15 fish/100 m) and Gardine Creek (4–9 fish/100 m) than in upper Greenhills Creek (0.7–5 fish/100 m; Figure 13). The same trend was observed for age-2+ WCT with greater densities in lower Greenhills Creek (7–11 fish/100 m) and Gardine Creek (4–24 fish/100 m) than in upper Greenhills Creek (1–10 fish/100 m; Figure 14).



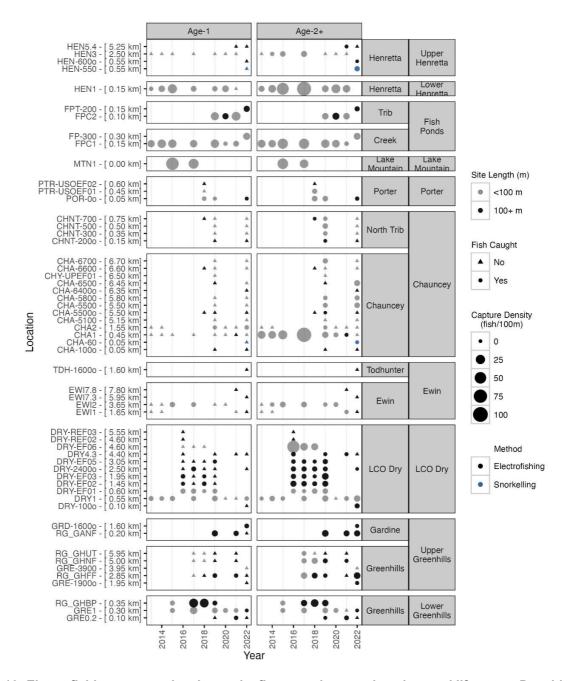


Figure 10: Electrofishing capture density on the first pass by year, location, and life stage. Densities from upstream snorkeling surveys targeting juvenile fish from Thorley et al. (2023b) are also shown. All locations shown are tributaries of the upper Fording River.

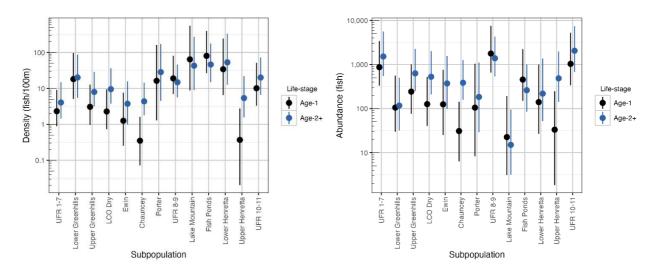


Figure 11: Estimated lineal densities (left panel) and abundances (right panel) by subpopulation and life stage in a typical year (with 95% Cls). Values are plotted on a logarithmic scale.

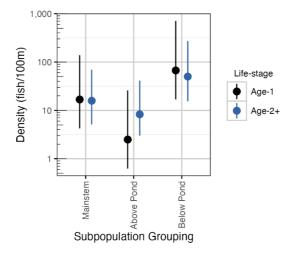


Figure 12: Estimated lineal density by subpopulation grouping and life stage in a typical year (with 95% Cls). Values are plotted on a logarithmic scale.

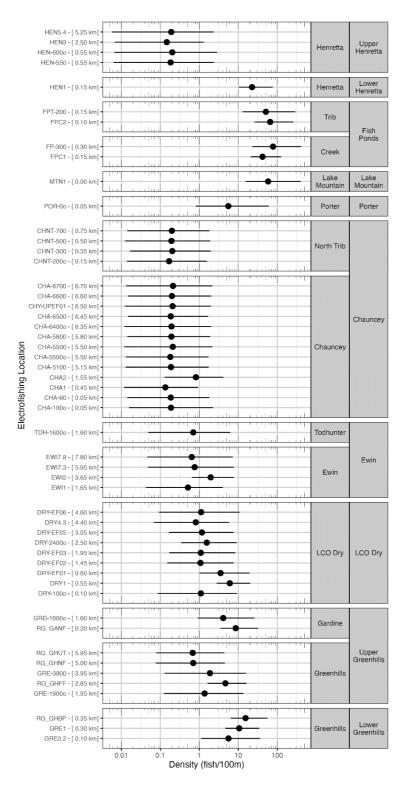


Figure 13: Estimated age-1 lineal density in a typical year by location and subpopulation (with 95% CIs), based on all years of available data. The densities are plotted on a logarithmic scale. Locations shown are tributaries or sections of the upper Fording River (UFR).



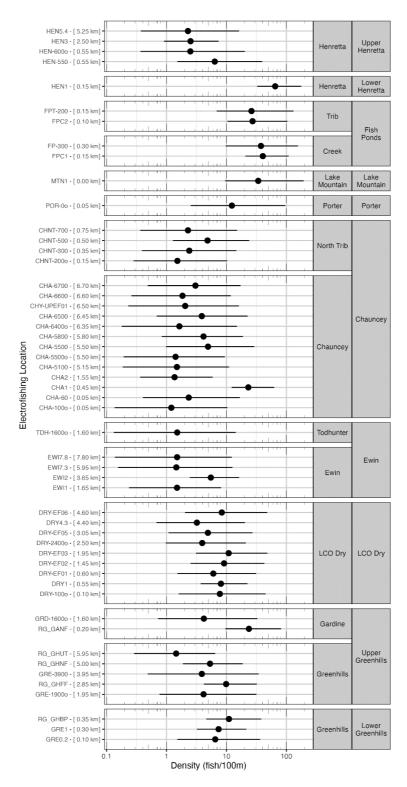


Figure 14: Estimated age-2+ lineal density in a typical year by location and subpopulation (with 95% Cls), based on all years of available data. The densities are plotted on a logarithmic scale. Locations shown are tributaries or sections of the upper Fording River (UFR).



3.6 Night-Time Dip-Net Survey

The night-time dip-net surveys targeted age-0 WCT and were conducted in lower and upper Greenhills Creek on 13 October 2022 (Table 6). In lower Greenhills Creek, three age-0 WCT were captured and no other age-0 WCT were observed. Lengths from captured fish were used in the analysis of length-at-age (Section 3.4). These data also demonstrate that lower Greenhills Creek provides rearing habitat for age-0 WCT. Age-0 WCT were not captured or observed in upper Greenhills Creek.

Table 6: Date, location, and catch of age-0 WCT during the night-time dip-net survey in Greenhills Creek.

Diff	Loca	ation	Number of Age-0			
Date	Start of Site (km²)	End of Site (km ^a)	Observed	Captured		
13 October 2022	25	300	0	3		
13 October 2022	1640	1970	0	0		

a. km refers to the distance upstream from the confluence of Greenhills Creek with the upper Fording River.

3.7 Snorkeling and Visual Observations

During the downstream snorkel survey on 31 August 2022, a total of 26 WCT were observed in the plunge pool at the outlet of the duckbill culvert in lower Greenhills Creek (Table 7). Based on the estimated fork lengths of these fish, and the age-1 length cutoffs for lower Greenhills Creek shown in Table 5, two of the WCT were age-0, 14 were age-1, and 10 were age-2+; subadults or adults (≥200 mm) were not recorded.

During effectiveness monitoring of the duckbill culvert barrier between October 2020 and September 2022, the number of WCT observed in the plunge pool ranged from 0 to 128 individuals (Table 8). WCT were not observed in the plunge pool during early spring of 2021 (late March to late May) or 2022 (late April to late May) but were present at all other times of year when monitoring occurred. The greatest abundance was observed on 16 August 2022 when 128 WCT were counted. WCT were rarely observed in the decant channel and stilling basin with counts ranging from 1 to 4 individuals, and WCT were not observed at these locations on many occasions.



Table 7: Number of Westslope Cutthroat Trout by fork length observed during snorkel surveys of the plunge pool at the duckbill culvert outlet in lower Greenhills Creek on 31 August 2022 as part of the downstream snorkel survey for the upper Fording River WCT monitoring program.

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Fork Length	Life Stage	Number of Fish
45–49 mm	Age-0	1
50–54 mm	Age-0	1
85–89 mm	Age-1	2
90–94 mm	Age-1	2
95–99 mm	Age-1	2
100–104 mm	Age-1	5
105–109 mm	Age-1	3
125–129 mm	Age-2+	1
135–139 mm	Age-2+	1
140–144 mm	Age-2+	4
145–149 mm	Age-2+	1
170–174 mm	Age-2+	1
180–184 mm	Age-2+	2
	Total	26



Table 8: Number of fish observed during snorkeling and visual observation surveys conducted during effectiveness monitoring of the duckbill culvert fish barrier as presented in AJM (2022).

.	Number of Fish (Dbserved
Date	Stilling Basin/Decant Channel	Plunge Pool
15 October 2020	0	14
10 December 2020	0	6
24 March 2021	0	0
4 May 2021	0	0
31 May 2021	0	0
30 June 2021	0	26
7, 13, 20 July 2021	0	<u>></u> 28ª
11 August 2021	1	46
19 August 2021	0	30
27 August 2021	0	43
22 September 2021	2	35
12 October 2021	1	40
12 November 2021	0	53
19 April 2022	0	0
17 May 2022	0	0
6 June 2022	0	4
20 July 2022	2	32
4 August 2022	1 ^b	72
16 August 2022	4	128
7 September 2022	3	67

a observations of at least 28 fish were made on 7, 13, or 20 July 2021.

3.8 Water Temperature

At the site in lower Greenhills Creek situated 300 m upstream of the confluence with the upper Fording River, 2,143 GSDD were accumulated in 2022. Compared to data collected in 2021 in the upper Fording River watershed, the value of GSDD in lower Greenhills Creek (2,143 GSDD) was substantially higher than any of the tributaries (typically less than 1,000 GSDD) and greater than nearly all sites in the upper Fording River, which ranged from 1,300 to 2,089 GSDD (Brooks et al. 2022). The estimate of GSDD in lower Greenhills Creek was used to help interpret results regarding growth and length-at-age of WCT (Sections 4.1.5 and 4.2.1). Estimates of GSDD from throughout the upper Fording River watershed will be used to model relationships with the size of age-0 WCT in future analyses (Brooks et al., in preparation).



^b unconfirmed whether a single fish was observed on three separate occasions or if three unique fish were encountered.

Because water temperature data were missing for a substantial portion of the growing season at the stations in upper Greenhills Creek and Gardine Creek, mean temperature in August was calculated for all three stations to compare temperature across the watershed. Mean water temperature in August (Table 9) was highest in lower Greenhills Creek, lowest in upper Greenhills Creek, and intermediate in Gardine Creek.

Table 9: Summary of water temperature in Greenhills Creek watershed in 2022.

Location	Station	Mean temperature in August	Growing Season Degree-Days
Lower Greenhills Creek	FR_FRTRGH	17.0°C	2143
Upper Greenhills Creek	GH_GRE_WT	5.1°C	n/a
Gardine Creek	GH_GAR	10.9°C*	n/a

^{*} At station GH GAR, data were missing for the first 3 days of August.

4.0 DISCUSSION

Results from the population monitoring program were used, along with supporting information from other reports, to address 10 guiding questions about the fish population (Sections 4.1 and 4.2). Integration of the results with other related monitoring programs is discussed in Section 4.3.

4.1 Population Characteristics

Questions about population characteristics are addressed to provide context for understanding the dynamics of the population. These characteristics are not expected to change frequently, though the state of knowledge should be updated as additional data are collected or if there are alterations to habitat or connectivity, such as the installation or removal of barriers.

4.1.1 What is the geographic range of the fish population?

Lower Greenhills Creek, from the plunge pool at the duckbill culvert outlet downstream to the upper Fording River, provides 0.6 km of habitat for WCT and this habitat is accessible to the population in the upper Fording River. The duckbill culvert outlet is considered a complete barrier that prevents the upstream movement of WCT (AJM 2022). Between the spillway from the Greenhills Creek sedimentation pond and the culvert, WCT have occasionally been observed in the stilling basin and decant channel (AJM 2022). These fish had likely moved downstream from the sedimentation pond and were subsequently captured and moved into the upper Fording River during fish salvage efforts (AJM 2022).

The Greenhills Creek sedimentation pond is approximately 150 m long and 400 m wide and provides habitat for WCT (Minnow 2018, 2019).

Upstream of the sedimentation pond, upper Greenhills Creek provides 4.9 km of habitat. The upper extent of fish habitat is where the headwaters emerge from the East Spoil Run Out (Cloutier et al. 2023). There are no impassable barriers in upper Greenhills Creek (Cloutier et al. 2023).



Gardine Creek provides habitat between its confluence with upper Greenhills Creek and an impassable barrier located 1.8 km upstream of its confluence (KNRC 2007).

4.1.2 What is the genetic diversity and effective genetic population size?

WCT in lower Greenhills Creek are part of the inter-breeding population in the upper Fording River watershed upstream of Josephine Falls. This population is genetically pure with no evidence of introgression from Rainbow Trout (*Oncorhynchus mykiss*; Rubidge and Taylor 2005; Carscadden and Rogers 2011). Estimates of the heterozygosity (H_E) have been used to assess the genetic diversity of WCT populations in BC and suggested that the diversity of WCT samples collected in 1998 (H_E =0.37) and 2000 (H_E =0.54) from the upper Fording River was close to the provincial average (H_E =0.56; Taylor et al. 2003).

The effective population size is the number of individuals in an idealized population, where genetic drift is the only factor in operation, that results in the same amount of genetic drift as the observed population (Wang et al. 2016). The effective population size is important because it determines the rate of change (loss) in H_E (i.e., diversity) of a population caused by genetic drift, which is the random sampling of genetic variants in a finite population (Charlesworth 2009). Therefore, the effective population size has implications for the diversity and long-term viability of a population. The 50/500 rule is a widely accepted rule-of-thumb for minimum effective population sizes (Harmon and Braude 2010) although a recent recommendation was that effective population of sizes of 100/1000 are more appropriate (Frankham et al. 2014). The 50/500 rule states that an effective population size of 50 is required to avoid inbreeding depression in the short-term while an effective population size of 500 is required to maintain evolutionary potential in the long term. In salmonid populations the effective population size is often assumed to be one-fifth the adult population size (Allendorf et al. 1997; Hastings et al. 2008) which puts the short and long-term minimum target adult population sizes at 250 and 2,500 individuals, respectively. The estimated population size of subadults and adults combined (≥200 mm) in the upper Fording River (excluding upper Greenhills and Gardine creeks) was greater than 2,500 in 2012 to 2014 and 2017, decreased to 330 in 2019, and increased to approximately 2,000 in 2022 (Thorley et al. 2023b). Given the increasing population trend, genetic diversity in the upper Fording River population does not appear to be a concern in the short term (Thorley et al. 2023b).

WCT in upper Greenhills Creek and Gardine Creek are an isolated population since the construction of the spillway in the early 1980s that prevents upstream fish movements. Although the genetic diversity has not been tested, because the population originated from the upper Fording River, the spillway/culvert are impassable, and no other fish species are present, it is assumed that the WCT population in upper Greenhills Creek remains genetically pure. Since isolation, the genetic diversity of this population is expected to have decreased over time due to genetic drift. The current level of genetic diversity of WCT in upper Greenhills Creek is unknown.

There is uncertainty in the adult population size in the upper Greenhills Creek watershed but the small amount of habitat and available data suggest that the population is small. The estimates of abundance of age-1 (50 to 89 mm) and age-2+ (90 to 199 mm) WCT were 248 and 715 fish, respectively, which was based on the entire length of habitat upstream of the barrier, including the sedimentation pond, upper Greenhills Creek, and Gardine Creek. These estimates are for immature fish, not an estimate of adult fish that is required to estimate effective population size. However, the estimates of age-1 and age-2+ fish suggest a relatively small population. A population estimate from mark-recapture data collected in the Greenhills sedimentation pond in July and October of 2017 was 514 individuals with a 95% confidence interval of 310 to 1,499 individuals; however, the life



stages represented in that estimate were not provided (Minnow 2018). The number of definitive nests counted in 2021 (n=2) and 2022 (n=6) also suggests a small population size of adults in upper Greenhills Creek and Gardine Creek. Although the adult population size in the upper Greenhills Creek watershed is unknown, available abundance data suggest that it is less than the long-term value based on the 50/500 rule (2,500 individuals) and may or may not be greater than the short-term value based on the 50/500 rule (250 individuals) for isolated populations, as described above.

4.1.3 What are the life history strategies within the fish population?

Life history strategies of WCT in the upper Fording River include fluvial residents that remain year-round within the same stream, fluvial migrants that reside mostly in the upper Fording River but migrate into tributaries to spawn, and adfluvial migrants that live in lake or ponds for part of the year but migrate into stream habitats to spawn (Cope et al. 2016; Thorley et al. 2023b). Based on a telemetry study by Cope et al. (2016) in the upper Fording River watershed, approximately 40% of tracked fish were fluvial migrants, 50% were fluvial residents that showed little annual movement, and 10% were adfluvial migrants residing in Henretta Lake. Fluvial migrants had an average home range of approximately 18 km and residents had a home range of approximately 5 km.

In lower Greenhills Creek, resident and migratory life history types are assumed to be present. In the isolated population upstream of the spillway, life history types could include fluvial residents and adfluvial migrants that spend most of the year in the sedimentation pond. Fish that move downstream of the sedimentation pond over the spillway would be permanently lost from the population in upper Greenhills Creek.

4.1.4 What is the timing of life history events?

The timing of spawning in upper and lower Greenhills Creek is primarily between mid-June and mid-July (Figure 2), which is within the range of the timing for the population in the upper Fording River (Figure 3). Cope et al. (2016) documented adult fish migrating to spawning areas in the upper Fording River watershed, including Greenhills Creek, in April and May. In a typical year, spawning commenced by 15 May and continued to about 15 July (Cope et al. 2016). Cope et al. (2016) observed that spawning activity started once mean daily water temperatures were 5°C and daily maximums exceeded 7°C.

Emergence of hatchery-reared WCT occurs after the eggs have accumulated 575 to 600 degree-days (Thorley et al. 2023b) which is consistent with Coleman and Fausch's (2007a) estimate of 570 to 600 Accumulated Thermal Units (ATUs) for Colorado Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*). Based on Cope et al. (2016), emergence and summer rearing begin in mid-July and last until the end of September.

Migration toward overwintering areas begins in September and lasts until mid-October, while the overwintering period itself starts in mid-October and lasts to the end of March (Cope et al. 2016).

4.1.5 What are the sizes of the life stages?

The length of age-0 WCT was larger in lower Greenhills Creek (64 mm, CI: 58–69 mm) than all other monitored tributaries and portions of the upper Fording River watershed (23 to 53 mm), based on estimates for a typical year (Figure 9). The length of age-0 WCT in upper Greenhills in unknown because this life stage has not been captured there since at least 2013, based on the data reviewed.



Age-1 WCT ranged from 75 to 114 mm in lower Greenhills Creek, which was greater than the size of this age class in most other tributaries and portions of the upper Fording River, based on data from 2013 to 2022. In upper Greenhills Creek (including Gardine Creek), age-1 WCT were smaller (50 to 89 mm) than most other tributaries and portions of the upper Fording River, with the exceptions of LCO Dry Creek and Chauncey Creek, which had similar sized age-1 WCT.

The size distributions of age-2 and older WCT overlapped and age data from scale samples are not currently available. Therefore, other life stages, the age-2+ (< 200 mm) and subadults and adults (≥200 mm) groupings, were assigned based on the 200 mm threshold suggested by Cope et al. (2016). Observations of spawning behaviour (paired up fish, or fish near redds) by WCT between 150 and 200 mm in LCO Dry Creek (Faulkner et al. 2020) suggest that the 200 mm cutoff may not be an appropriate minimum size for mature adults in headwater tributaries in the study area.

The length distribution of all age classes from age-2 and older, and the length-at-maturity are uncertain, especially in smaller tributaries of the upper Fording River.

The larger size of age-0 WCT in lower Greenhills Creek did not appear to be due to earlier spawning, as the majority of spawning occurred between mid-June and mid-July, which was similar to the timing of most other subpopulations in the upper Fording River watershed (Thorley et al. 2023b). The large size of age-0 WCT was likely related to the warm water temperature downstream of the sedimentation pond, as the number of GSDD was greater in lower Greenhills Creek than all other areas where GSDD was calculated in the upper Fording River watershed (Section 3.8)

4.2 Vital Rates and Associated Endpoints

4.2.1 What is the growth rate of key life stages?

Using combined length-at-age and growth increment data, Cope et al. (2016), estimated a growth rate parameter (k) for WCT in the upper Fording River of 0.15 (95% CI of 0.11 to 0.20), which is comparable to other WCT in headwater streams in the Canadian Rocky Mountains (range 0.13 to 0.20; Janowicz et al. 2018). In the mainstem of the upper Fording River, WCT were estimated to reach the minimum size of the subadults and adult category (≥200 mm) beginning at age-3 or age-4, and the smallest length-at-maturity was 200 mm for males and 233 mm for females (Cope et al. 2016). However, the growth rate likely varies substantially by stream and individual due to the diversity of temperature regimes and life history strategies. Evidence for variable growth rates includes the variation in size of age-0 fish in different tributaries (Figure 9). The large size of age-0 and age-1 WCT in lower Greenhills Creek suggests more rapid growth of early stages than in other parts of the upper Fording River watershed, which was likely related to warm water temperatures. Annual growth of WCT (size range: 129 to 346 mm) in upper Greenhills Creek and the sedimentation pond, based on three fish tagged in 2017 and recaptured in 2018, ranged from 31 to 91 mm per year (Minnow 2019).

4.2.2 What is the spatial distribution of key life stages?

Age-0 WCT are likely present in upper and lower Greenhills Creek and in Gardine Creek. Age-0 WCT were captured in lower Greenhills Creek but not in upper Greenhills Creek or Gardine Creek between 2013 and 2022 (Figure 8). Although age-0 WCT have not been captured upstream of the sedimentation pond, as age-1 WCT are

present and it is an isolated population, age-0 fish must have been present in prior years and survived to age-1. A previous study in upper Greenhills Creek (Minnow 2018) reported the capture of age-0 WCT but based on their lengths (94 to 106 mm), and the length-at-age cutoffs used in this report (Figure 8), these fish were likely age-1 or age-2.

Age-1 and age-2+ WCT are present throughout the Greenhills Creek watershed.

The distribution of subadults and adults (≥200 mm) is not known because backpack electrofishing does not target these life stages and downstream snorkel surveys are not conducted in Greenhills Creek (except in the stilling basin and decant channel as part of effectiveness monitoring or fish salvages). However, redd surveys demonstrate that spawning activity by adults occurs in lower and upper Greenhills Creek and in Gardine Creek.

WCT captured in the Greenhills Creek sedimention pond ranged in length from 120 to 382 mm (Minnow 2018), suggesting age-2 to adult life stages are present in the pond; younger age classes could also be present but were not captured using the sampling methods used (hoop-nets and gill-nets).

4.2.3 What is the abundance of key life stages?

The abundance of age-0 fish is unknown because abundance estimates are not possible using the selected monitoring methods.

The estimated total abundance of age-1 WCT in a typical year was 119 individuals (CI: 33–624 individuals) in lower Greenhills Creek and 248 individuals (CI: 75–1107 individuals) in upper Greenhills Creek including Gardine Creek (Figure 11). The estimated total abundance of age-2+ WCT (from age-2 up to 200 mm) in a typical year was 161 individuals (CI: 38–804 individuals) in lower Greenhills Creek and 715 individuals (CI: 248–3104 individuals) in upper Greenhills Creek. Although densities of both life stages were lower in upper Greenhills Creek than lower Greenhills Creek, the more extensive habitat in upper Greenhills Creek resulted in a greater total abundance estimate. The low number of sites sampled in different years make it difficult to assess temporal trends, but the data do not suggest any substantial or sustained change in density over time in Gardine Creek, upper Greenhills Creek, or lower Greenhills Creek.

The abundance of the subadult and adult (≥200 mm) WCT is unknown because this life stage is not currently targeted by the capture methods used in the Greenhills Creek watershed.

4.2.4 What is the total number of eggs deposited?

Total egg deposition can be estimated using the estimated abundance of mature adults, the length-distribution of adults, and assumptions about the length-fecundity relationship, the sex ratio, and the probability of spawning. As estimates of the abundance and length distribution of mature adults in upper Greenhills Creek are not available, the number of eggs deposited is unknown. An alternative way to estimate egg deposition would be based on the estimated number of redds, and assumptions about the observer efficiency and the average number of eggs per redd. Based on the low number of redds observed in upper Greenhills Creek (including Gardine Creek) in 2022 (*n*=6), the spawning survey may not be detecting all of the nests and therefore nest counts were not used for an approximate estimate of egg deposition. Based on these recent spawning survey data, the nest counts are not currently considered a robust indicator of total spawner abundance but do provide information on the timing and spatial distribution of spawning.



WCT in lower Greenhills Creek are part of the upper Fording River population. For this population, egg deposition was estimated using the estimated abundance and lengths of subadult and adult fish, along with assumptions of a 1:1 sex ratio and a 50% probability of spawning each year. The total egg deposition for the upper Fording River population was estimated to have peaked at approximately 970,000 eggs in 2017 before decreasing to approximately 60,000 eggs in 2019, and increasing to approximately 430,000 eggs by 2022 (Thorley et al. 2023b). These authors considered the estimates of egg deposition to be likely overestimates, because the estimates of the number subadult and adult fish included immature and mature fish.

4.2.5 What is the survival of key life stages?

Survival from the egg stage to age-1 was estimated for the upper Fording River population using estimates of the number of eggs deposited and age-1 abundance. The estimated egg to age-1 survival rate ranged from a minimum of 0.5% in the 2012 spawning year to a maximum of 3.2% in 2019 and was 0.8% in the 2021 spawning year, which is the most recent year for which age-1 abundance estimates are available (Thorley et al. 2023b). These estimates are likely underestimates of survival because of the overestimation of egg deposition due to inclusion of immature fish in the abundance estimate of subadult and adults (Thorley et al. 2023b). In comparison, the egg to age-1 survival rate required for population replacement (i.e., when each adult produces one offspring) that was calculated based on life history parameters (Ma and Thompson 2021) was 2.0% (Thorley et al. 2023b). These estimates of egg to age-1 survival in the upper Fording River are also considered applicable to WCT in lower Greenhills Creek.

The annual survival rate of radio tagged subadult and adult WCT in the UFR was 67% (Cope et al. 2016), which is assumed to also apply to lower Greenhills Creek.

In upper Greenhills Creek, egg to age-1 survival cannot be estimated because adult abundance and therefore egg deposition is unknown. It is uncertain whether survival of eggs, juveniles, and adults in upper Greenhills Creek differ from survival rates estimated in the upper Fording River.

4.3 Integration with Other Monitoring Programs

Results from this monitoring program will also be used by the Greenhills Creek Local Aquatic Effects Monitoring Program (LAEMP; formerly GGCAMP). Results concerning aquatic habitat conditions from the Greenhills Creek LAEMP will also be used in future years to help interpret possible causes of observed trends in fish populations in the Greenhills Creek watershed. The Greenhills Creek LAEMP was initially designed to monitor the effects of anti-scalant addition that was intended to prevent further calcite deposition and concretion, but the program was recently modified to also consider the effects of other influences and mitigation activities in the watershed (Minnow 2022). Study questions in the Greenhills Creek LAEMP are the following:

- 1. What is the current status of aquatic health in Greenhills and Gardine creeks, as evidenced by physical, chemical, and biological conditions?
- 2. Have physical, chemical, and/or biological conditions indicative of aquatic health in Greenhills and Gardine creeks changed over time and are the changes expected based on the activities and projects occurring in the watershed?

3. Can observed changes be linked to antiscalant addition in lower Greenhills Creek; activities to support relocation of the antiscalant addition facility to Upper Greenhills Creek; or initiation of antiscalant addition on Upper Greenhills Creek starting in October 2022?

For all three study questions, WCT are included as part of the assessment of aquatic health and biological conditions. The Greenhills Creek LAEMP's general questions related to fish are the following:

- 1. Do estimates of WCT abundance, densities, biomass, or health endpoints differ among areas?
- 2. Have endpoints changed at the monitoring areas over time and are these changes unexpected based on the activities and projects occurring in the watershed, including the addition of antiscalant to lower Greenhills Creek?

Estimated densities from this report can be used to address sub-question #1. The estimated density of age-2+ WCT was greater in lower Greenhills Creek (8–12 fish/100 m) and Gardine Creek (4–26 fish/100 m) than in upper Greenhills Creek (1–10 fish/100 m; Figure 14). Age-1 WCT were present in Gardine Creek and lower Greenhills Creek but were not captured in upper Greenhills Creek during most sample years (Figure 10). Snorkel surveys consistently reported large numbers of juvenile fish (age-1 and age-2+) in the plunge pool of the culvert outlet into lower Greenhills Creek. Regarding sub-question #2, the relatively low number of sites sampled makes it difficult to assess temporal trends. However, the available electrofishing data did not suggest any substantial changes or sustained trends in the density of age-1 or age-2+ WCT in upper Greenhills Creek, Gardine Creek, or lower Greenhills Creek between 2015 and 2022. In addition to the Greenhills Creek LAEMP, a summary of aquatic monitoring data from the upper Fording River watershed upstream of Josephine Falls (Teck's management unit #1), including fish population results from lower and upper Greenhills Creek, will be included as part of the upcoming Regional Aquatic Effects Monitoring Program's 2020 to 2022 interpretive report.

5.0 SUMMARY AND CONCLUSIONS

Although lower Greenhills Creek is a short (0.58 km) section of tributary, it appears to provide spawning habitat for adults and rearing habitat for juveniles. The exceptionally large size of age-0 WCT was attributed to warm water temperature, as indicated by GSDD, that is likely due to warming in the sedimentation pond upstream. WCT in lower Greenhills Creek are part of the upper Fording River population that decreased substantially (approximately 90%) between 2017 and 2019, but increased consecutively each year from 2020 to 2022, suggesting that the population is recovering (Thorley et al. 2023b). Most vital rates, such as survival, growth, and reproduction (egg deposition), are at least partially understood for the upper Fording River WCT population (Section 4.2; Thorley et al. 2023b). Length-at-age and length-at-maturity are important uncertainties, as the inability to separate subadults and adults likely biases estimates of egg deposition and survival and therefore limits understanding of the resulting population dynamics.

The upper Greenhills Creek watershed provides approximately 7 km of habitat to an isolated population of WCT in upper Greenhills Creek, Gardine Creek, and the Greenhills Creek sedimentation pond. The number of definitive nests observed during spawning surveys in 2021 and 2022 was low (≤6 nests per year), but densities of age-1 WCT were similar to other tributaries that were not below ponds (Figure 13), which indicates that successful spawning and recruitment is occurring. Estimated densities of age-1 and age-2+ (<200 mm) WCT did not suggest any temporal trends between 2013 and 2022, although the number of sites sampled was low and not consistent across years. The catch data do not suggest a decline in juvenile WCT abundance in upper Greenhills Creek between 2017 and 2019, as was observed for subadults and adults (but not juveniles) in the upper Fording River.



The length distributions of age-2 and older age classes, and the length-at-maturity in upper Greenhills Creek are uncertain and may differ in this isolated headwater population compared to the upper Fording River. The abundance of adults and survival between different life stages cannot be estimated using available data. The genetic diversity and effective population size in upper Greenhills Creek are uncertain but are likely both substantially lower than for the upper Fording River population from which the fish have been isolated for over

6.0 CLOSURE

We trust that this report meets your current requirements. If you have any further questions, please do not hesitate to contact us.

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40 years.

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https://golderassociates.sharepoint.com/sites/169917/project files/5 technical work/greenhills/report/final/23586694-001-r-rev0-gho greenhills creek 2022 fish population monitoring 08may_23.docx

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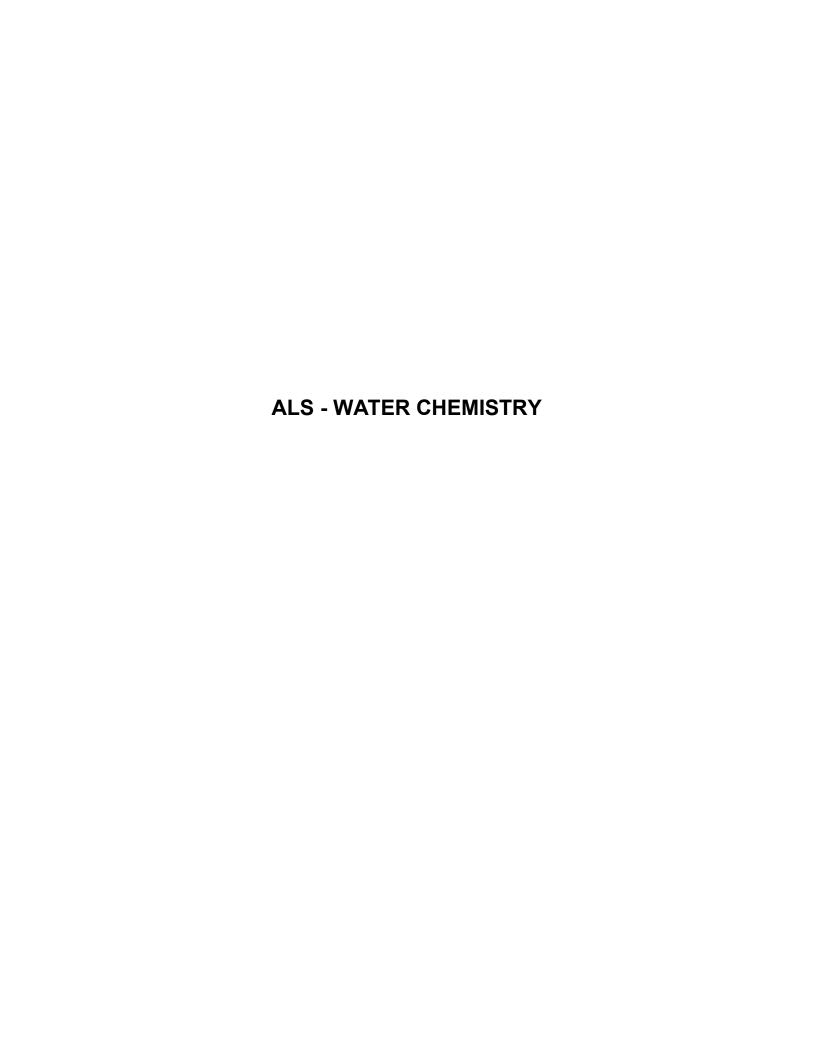


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APPENDIX D RAW LABORATORY REPORTS





CERTIFICATE OF ANALYSIS

Work Order : CG2202277

Client : Teck Coal Limited

Contact : Giovanna Diaz

Address : 421 Pine Ave

Sparwood BC Canada

Telephone : ---

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00748510

C-O-C number : February GGCAMP 2022

Sampler : --Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 7

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets
Address : 2559 29th Street N

ess : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 01-Mar-2022 09:21

Date Analysis Commenced : 01-Mar-2022

Issue Date : 11-Mar-2022 17:45

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta

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Work Order : CG2202277

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Sample Comments

CG2202277-004	RG_TRIP_WS_GGCAMP_202 2-02-28_NP	Sample 4: Water sample for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
00000077 004	2-02-28_NP	
CG2202277-004	RG_TRIP_WS_GGCAMP_202	004 - hg vial submitted
Sample	Client Id	Comment

Qualifiers

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
	Conductivity.
RRV	Reported result verified by repeat analysis.

>: greater than.

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Work Order : CG2202277

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM

TKNI TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.



Page : 4 of 7
Work Order : CG2202277
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)	RG_FBLANK_W S_GGCAMP_20 22-02-28_NP	RG_GHBP_WS_ GGCAMP_2022- 02-28_NP	RG_RIVER_WS _GGCAMP_202 2-02-28_NP	RG_TRIP_WS_ GGCAMP_2022- 02-28_NP					
			Client samp	oling date / time	28-Feb-2022 10:00	28-Feb-2022 10:00	28-Feb-2022 10:00	28-Feb-2022 10:00	
Analyte	CAS Number	Method	LOR	Unit	CG2202277-001	CG2202277-002	CG2202277-003	CG2202277-004	
					Result	Result	Result	Result	
Physical Tests									
acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	<1.0	299	300	<1.0	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	<1.0	365	366	<1.0	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	<1.0	299	300	<1.0	
conductivity		E100	2.0	μS/cm	<2.0	1600	1610	<2.0	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	<0.50	1070	1080	<0.50	
oxidation-reduction potential [ORP]		E125	0.10	mV	511	472	416	507	
рН		E108	0.10	pH units	5.23	8.26	8.28	5.09	
solids, total dissolved [TDS]		E162	10	mg/L	<10	1400	1430	<10	
solids, total suspended [TSS]		E160-L	1.0	mg/L	<1.0	<1.0	2.4	<1.0	
turbidity		E121	0.10	NTU	<0.10	0.48	0.40	<0.10	
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.0215	0.0214	<0.0050	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.250 DLDS	<0.250 DLDS	<0.050	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	<0.10	2.10	2.03	<0.10	
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	0.136	0.132	<0.020	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	<0.050	0.492	0.392 TKNI	<0.050	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	4.81	4.76	0.0081 RRV	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	0.0114	0.0115	<0.0010	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	0.0026	0.0025	<0.0010	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	0.0036	0.0039	<0.0020	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	776	765	<0.30	
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	<0.50	1.62	1.62		
carbon, total organic [TOC]		E355-L	0.50	mg/L	<0.50	1.84	1.92	<0.50	

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Work Order : CG2202277
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)	RG_FBLANK_W S_GGCAMP_20 22-02-28_NP	RG_GHBP_WS_ GGCAMP_2022- 02-28_NP	RG_RIVER_WS _GGCAMP_202 2-02-28_NP	RG_TRIP_WS_ GGCAMP_2022- 02-28_NP					
				ling date / time	28-Feb-2022 10:00	28-Feb-2022 10:00	10:00 10:00 10:00		
Analyte	CAS Number	Method	LOR	Unit	CG2202277-001 Result	CG2202277-002 Result	CG2202277-003 Result	CG2202277-004 Result	
Ion Balance					Result	Result	Nesuit	Nesuit	
anion sum		EC101	0.10	meq/L	<0.10	22.5	22.3	<0.10	
cation sum		EC101	0.10	meq/L	<0.10	21.7	21.8	<0.10	
ion balance (cations/anions)		EC101	0.010	%	100	96.4	97.8	100 RRV	
ion balance (APHA)		EC101	0.010	%	<0.010	1.81	1.13	<0.010	
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	0.0045	0.0045		
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	0.00039	0.00038		
arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	0.00023	0.00023		
barium, total	7440-39-3	E420	0.00010	mg/L	<0.00010	0.0422	0.0424		
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	<0.020	<0.020		
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050		
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	0.010	0.010		
cadmium, total	7440-43-9	E420	0.0050	μg/L	<0.0050	0.0083	0.0076		
calcium, total	7440-70-2	E420	0.050	mg/L	<0.050	175	180		
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	0.00014	0.00014		
cobalt, total	7440-48-4	E420	0.10	μg/L	<0.10	<0.10	<0.10		
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050		
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	<0.010		
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050		
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	0.0158	0.0159		
magnesium, total	7439-95-4	E420	0.0050	mg/L	<0.0050	147	147		
manganese, total	7439-96-5	E420	0.00010	mg/L	<0.00010	0.00317	0.00314		
mercury, total	7439-97-6	E508-L	0.00050	μg/L	<0.00050	<0.00050	<0.00050		
molybdenum, total	7439-98-7	E420	0.000050	mg/L	<0.000050	0.00157	0.00160		
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	0.00803	0.00791		
potassium, total	7440-09-7	E420	0.050	mg/L	<0.050	2.35	2.35		
selenium, total	7782-49-2	E420	0.050	μg/L	<0.050	145	145		
silicon, total	7440-21-3	E420	0.10	mg/L	<0.10	3.93	3.91		
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010		
sodium, total	7440-23-5	E420	0.050	mg/L	<0.050	3.16	3.07		

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Work Order : CG2202277
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_FBLANK_W S_GGCAMP_20 22-02-28 NP	RG_GHBP_WS_ GGCAMP_2022- 02-28 NP	RG_RIVER_WS _GGCAMP_202 2-02-28_NP	RG_TRIP_WS_ GGCAMP_2022- 02-28 NP	
			Client samp	ling date / time	28-Feb-2022 28-Feb-2022 10:00 10:00			28-Feb-2022 10:00	
Analyte	CAS Number	Method	LOR	Unit	CG2202277-001	CG2202277-002	CG2202277-003	CG2202277-004	
Total Metals					Result	Result	Result	Result	
strontium, total	7440-24-6	E420	0.00020	mg/L	<0.00020	0.206	0.209		
sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	260	262		
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010		
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010		
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030		
uranium, total	7440-61-1	E420	0.000010	mg/L	<0.000010	0.00808	0.00799		
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050		
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	<0.0030		
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	0.00034	0.00034	<0.00010	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	0.00016	0.00017	<0.00010	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	0.0409	0.0413	<0.00010	
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.020	<0.020	<0.020	<0.020	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	<0.0050	<0.0050	0.0058	<0.0050	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	188	189	<0.050	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	0.00013	<0.00010	<0.00010	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L				<0.10	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010		
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	0.0150	0.0149	<0.0010	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	147	148	<0.0050	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	0.00194	0.00188	<0.00010	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.000050	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	0.00147	0.00152	<0.000050	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.00780	0.00778	<0.00050	

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Work Order : CG2202277
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water	Client sample ID			RG_FBLANK_W	RG_GHBP_WS_	RG_RIVER_WS	RG_TRIP_WS_		
(Matrix: Water)					S_GGCAMP_20 22-02-28_NP	GGCAMP_2022- 02-28_NP	_GGCAMP_202 2-02-28_NP	GGCAMP_2022- 02-28_NP	
	Clier		Client samp	ling date / time	28-Feb-2022 10:00	28-Feb-2022 10:00	28-Feb-2022 10:00	28-Feb-2022 10:00	
Analyte	CAS Number	Method	LOR	Unit	CG2202277-001	CG2202277-002	CG2202277-003	CG2202277-004	
					Result	Result	Result	Result	
Dissolved Metals									
potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	2.26	2.26	<0.050	
selenium, dissolved	7782-49-2	E421	0.050	μg/L	<0.050	139	144	<0.050	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	3.74	3.86	<0.050	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	<0.050	3.02	3.05	<0.050	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	0.213	0.214	<0.00020	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	250	252	<0.50	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	0.00741	0.00732	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0.0010	<0.0010	
dissolved mercury filtration location		EP509	-	-	Field	Field	Field	Field	
dissolved metals filtration location		EP421	-	-	Field	Field	Field	Field	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : CG2202277 Page : 1 of 21

 Client
 : Teck Coal Limited
 Laboratory
 : Calgary - Environmental

 Contact
 : Giovanna Diaz
 Account Manager
 : Lyudmyla Shvets

 Address
 : 421 Pine Ave
 Address
 : 2559 29th Street NE

Sparwood BC Canada Calgary, Alberta Canada T1Y 7B5

Telephone : +1 403 407 1800

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 01-Mar-2022 09:21

 PO
 : VPO00748510
 Issue Date
 : 11-Mar-2022 17:46

C-O-C number : February GGCAMP 2022

Sampler : ---Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 4
No. of samples analysed : 4

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples ■ No Quality Control Sample Frequency Outliers occur.							

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Matrix: Water

Analyte Group

HDPE

RG RIVER WS GGCAMP 2022-02-28 NP

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

01-Mar-2022

✓

28 days 1 days

Analysis

Analysis Holding Time Compliance

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

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

Sampling Date

Method

E235.Br-L

Extraction / Preparation

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

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

Container / Client Sample ID(s) **Holding Times** Eval Analysis Date Holding Times Eval Preparation Rec Actual Date Rec Actual Anions and Nutrients : Ammonia by Fluorescence Amber glass total (sulfuric acid) F298 28-Feb-2022 01-Mar-2022 1 1 RG FBLANK WS GGCAMP 2022-02-28 NP 28 1 days 01-Mar-2022 27 days 0 days days Anions and Nutrients: Ammonia by Fluorescence Amber glass total (sulfuric acid) E298 28-Feb-2022 01-Mar-2022 ✓ 01-Mar-2022 27 days 0 days ✓ RG GHBP WS GGCAMP 2022-02-28 NP 1 days 28 days Anions and Nutrients : Ammonia by Fluorescence Amber glass total (sulfuric acid) RG RIVER WS GGCAMP 2022-02-28 NP E298 28-Feb-2022 01-Mar-2022 ✓ 01-Mar-2022 27 days 0 days 1 days 28 days Anions and Nutrients: Ammonia by Fluorescence Amber glass total (sulfuric acid) RG_TRIP_WS_GGCAMP_2022-02-28_NP E298 28-Feb-2022 01-Mar-2022 1 days 1 01-Mar-2022 27 days 0 days 28 days Anions and Nutrients: Bromide in Water by IC (Low Level) HDPE RG FBLANK WS GGCAMP 2022-02-28 NP E235.Br-L 28-Feb-2022 01-Mar-2022 28 days 1 days Anions and Nutrients : Bromide in Water by IC (Low Level) **HDPE** E235.Br-L 28-Feb-2022 RG GHBP WS GGCAMP 2022-02-28 NP 01-Mar-2022 28 days 1 days --------Anions and Nutrients: Bromide in Water by IC (Low Level)

28-Feb-2022

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Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

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Analyte Group	Method	Sampling Date	Extraction / Preparation			Analysis				
Container / Client Sample ID(s)			Preparation Holding Times		Eval	Analysis Date	Holding Times		Eval	
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.Br-L	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E235.CI-L	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E235.CI-L	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E235.CI-L	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.CI-L	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace	Level)									
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E378-U	28-Feb-2022					02-Mar-2022	3 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace	Level)									
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E378-U	28-Feb-2022					02-Mar-2022	3 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace	Level)									
HDPE										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E378-U	28-Feb-2022					02-Mar-2022	3 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace	Level)									
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E378-U	28-Feb-2022					02-Mar-2022	3 days	2 days	✓

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										Holding Tim
Analyte Group	Method	Sampling Date	Ext	raction / Pi	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
RG FBLANK WS GGCAMP 2022-02-28 NP	E235.F	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
								-	-	
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
RG GHBP WS GGCAMP 2022-02-28 NP	E235.F	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
NO_OFIDE _VVO_OGOANNE_2022-02-20_IN	2200.1	20 1 05 2022					01-War-2022	20 days	1 days	,
Anions and Nutrients : Fluoride in Water by IC								1		
HDPE	F005 F	00 5 4 0000					04 M 0000	00.1	4 1	,
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E235.F	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.F	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E235.NO3-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E235.NO3-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
 								,-	, -	
Anions and Nutrients : Nitrate in Water by IC (Low Level)								T		
HDPE	Egge NO3 I	20 Feb 2022					04 M-= 0000	0 -1	4	√
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E235.NO3-L	28-Feb-2022					01-Mar-2022	3 days	1 days	•
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.NO3-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
DO EDI ANIC MO GOGAME 0000 00 00 10	E235.NO2-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E235.NO2-L	20-Feb-2022					O I IVIGITZOZZ	o days	1 days	

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Analyte Group	Method	Sampling Date	Ext	traction / P	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E235.NO2-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG RIVER WS GGCAMP 2022-02-28 NP	E235.NO2-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
110_111VE11_VVO_GGGAWII _2022-02-20_1VI	2200102 2	20 1 05 2022					01-10101-2022	o days	1 days	•
Anions and Nutrients : Nitrite in Water by IC (Low Level)				I				1		
HDPE	Eggs NOO I	00 5 1 0000					04 M 0000	0.1	4 1	,
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.NO2-L	28-Feb-2022					01-Mar-2022	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E235.SO4	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG GHBP WS GGCAMP 2022-02-28 NP	E235.SO4	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC							l			
HDPE								<u> </u>		
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E235.SO4	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
110_111/211_110_000/11111 _2022 02 20_111		20 : 02 2022					0 : 2022	20 00,0	,	
Anions and Nutrients : Sulfate in Water by IC										
HDPE	F225 CO4	20 Feb 2022					04 M-= 2000	00 4	4 4	,
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E235.SO4	28-Feb-2022					01-Mar-2022	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E318	28-Feb-2022	08-Mar-2022	28	9 days	✓	09-Mar-2022	19 days	1 days	✓
				days						
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E318	28-Feb-2022	08-Mar-2022	28	9 days	✓	09-Mar-2022	19 days	1 days	✓
		1		1	1 - 1			1		

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Matrix: Water						alaation.	Holding time exce	oudinoo ,	V V I CI III I	Tiolaling Till
Analyte Group	Method	Sampling Date	Ex	traction / Pi	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E318	28-Feb-2022	08-Mar-2022	28	9 days	✓	09-Mar-2022	19 days	1 days	✓
				days						
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E318	28-Feb-2022	09-Mar-2022	28	9 days	✓	10-Mar-2022	19 days	1 days	✓
				days						
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)									'	
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E372-U	28-Feb-2022	02-Mar-2022	28	2 days	✓	02-Mar-2022	26 days	0 days	✓
				days						
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E372-U	28-Feb-2022	02-Mar-2022	28	2 days	✓	02-Mar-2022	26 days	0 days	✓
				days						
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E372-U	28-Feb-2022	02-Mar-2022	28	2 days	✓	02-Mar-2022	26 days	0 days	✓
				days						
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E372-U	28-Feb-2022	02-Mar-2022	28	2 days	✓	02-Mar-2022	26 days	0 days	✓
				days						
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E421.Cr-L	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)									1	
HDPE dissolved (nitric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E421.Cr-L	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E421.Cr-L	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		

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Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E421.Cr-L	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		
Dissolved Metals : Dissolved Mercury in Water by CVAAS				-						
Glass vial dissolved (hydrochloric acid)										
RG FBLANK WS GGCAMP 2022-02-28 NP	E509	28-Feb-2022	08-Mar-2022	28	8 days	1	08-Mar-2022	20 days	0 days	✓
110_1 BENNIN_110_00074111 _E0ZE 0Z 20_141			00 2022	days	o days		00 11141 2022	20 44,0	o dayo	
Disabled Matels - Disabled Managements Water Inc. OVA A C				dayo						
Dissolved Metals : Dissolved Mercury in Water by CVAAS Glass vial dissolved (hydrochloric acid)							I			
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E509	28-Feb-2022	08-Mar-2022	28	8 days	√	08-Mar-2022	20 days	0 days	✓
NG_GLIDF_WG_GGCAWIF_2022-02-20_NF	L309	20-1 65-2022	00-Mai-2022		0 days	Ť	00-Wai-2022	20 days	0 days	•
				days						
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E509	28-Feb-2022	08-Mar-2022	28	8 days	✓	08-Mar-2022	20 days	0 days	✓
				days						
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE dissolved (nitric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E509	28-Feb-2022	08-Mar-2022	28	8 days	✓	08-Mar-2022	20 days	0 days	✓
				days						
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E421	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E421	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS				,-						
·					l			T		
HDPE dissolved (nitric acid) RG RIVER WS GGCAMP 2022-02-28 NP	E421	28-Feb-2022	06-Mar-2022	100	6 days	√	07-Mar-2022	174	1 days	1
1.0_1.1VL1_VVO_GGGAIVIF_2022-02-20_1VF	L421	20-1 GD-2022	00-iviai-2022	180	o uays	•	01-IVIAI-2022	174	1 uays	•
				days				days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E421	28-Feb-2022	06-Mar-2022	180	6 days	✓	07-Mar-2022	174	1 days	✓
				days				days		

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Analyte Group	Method	Sampling Date	Ext	traction / Pr	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Leve	el)									
Amber glass dissolved (sulfuric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E358-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
				days						
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Leve	el)			-						
Amber glass dissolved (sulfuric acid)										
RG GHBP WS GGCAMP 2022-02-28 NP	E358-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 davs	✓
1.0_0.130_000,				days	, -				, -	
Overania / Incurrenia Carban - Discolused Overania Carban by Carrbustian // avy lavy	-1)									
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Leve Amber glass dissolved (sulfuric acid)	∍i) 									
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E358-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
110_111VE11_VVO_000/11VIII _2022-02 20_11I	2000 2	20 1 00 2022	OT MAI 2022	days	ladyo	·	OZ Mai ZOZZ	Zi dayo	, aayo	
				uays						
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)			l l	l			T		I
Amber glass total (sulfuric acid)	E255 1	00 F-1 0000	04 M 0000		4	,	00 Mar 0000	07 -1	4 -1	
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E355-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
				days						
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E355-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
				days						
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E355-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
				days						
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E355-L	28-Feb-2022	01-Mar-2022	28	1 days	✓	02-Mar-2022	27 days	1 days	✓
				days						
Physical Tests : Acidity by Titration				,						
HDPE										
RG FBLANK WS GGCAMP 2022-02-28 NP	E283	28-Feb-2022					02-Mar-2022	14 days	2 days	1
1.0_1 bib 1111_110_000A1911		20-1 05-2022					OZ-IVIGI-ZOZZ	1.7 days	_ uuys	•
Physical Tests : Acidity by Titration										
LIDDE							The second secon	1		
HDPE RG GHBP WS GGCAMP 2022-02-28 NP	E283	28-Feb-2022					02-Mar-2022	14 days	O dove	1

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Project : REGIONAL EFFECTS PROGRAM



Matrix: Water						aluation. • –	Holding time exce	cuarice , •	- ٧٧١٤١١١١١	riolaling rillin
Analyte Group	Method	Sampling Date	Ext	raction / Pi	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	7 Times Actual	Eval
Physical Tests : Acidity by Titration										
HDPE RG_RIVER_WS_GGCAMP_2022-02-28_NP	E283	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_TRIP_WS_GGCAMP_2022-02-28_NP	E283	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E290	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_GHBP_WS_GGCAMP_2022-02-28_NP	E290	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_RIVER_WS_GGCAMP_2022-02-28_NP	E290	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_TRIP_WS_GGCAMP_2022-02-28_NP	E290	28-Feb-2022					02-Mar-2022	14 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E100	28-Feb-2022					02-Mar-2022	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_GHBP_WS_GGCAMP_2022-02-28_NP	E100	28-Feb-2022					02-Mar-2022	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_RIVER_WS_GGCAMP_2022-02-28_NP	E100	28-Feb-2022					02-Mar-2022	28 days	2 days	✓

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wattrx: water			_			diddion. • =	Tolding lime exce			Triolaing Til
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	SÍS	
Container / Client Sample ID(s)			Preparation		g Times	Eval	Analysis Date		g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Conductivity in Water										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E100	28-Feb-2022					02-Mar-2022	28 days	2 days	✓
Physical Tests : ORP by Electrode										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E125	28-Feb-2022					08-Mar-2022	0 hrs	193 hrs	*
										EHTR-FN
Physical Tests : ORP by Electrode										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E125	28-Feb-2022					08-Mar-2022	0 hrs	193 hrs	*
										EHTR-FM
Physical Tests : ORP by Electrode										
HDPE										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E125	28-Feb-2022					08-Mar-2022	0 hrs	193 hrs	3¢
										EHTR-FN
Physical Tests : ORP by Electrode										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E125	28-Feb-2022					08-Mar-2022	0 hrs	193 hrs	×
										EHTR-FM
Physical Tests : pH by Meter										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E108	28-Feb-2022					02-Mar-2022	0 hrs	49 hrs	3c
										EHTR-FN
Physical Tests : pH by Meter										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E108	28-Feb-2022					02-Mar-2022	0 hrs	49 hrs	æ
										EHTR-FN
Physical Tests : pH by Meter										
HDPE										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E108	28-Feb-2022					02-Mar-2022	0 hrs	49 hrs	3 0
										EHTR-FM
Physical Tests : pH by Meter								1		
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E108	28-Feb-2022					02-Mar-2022	0 hrs	49 hrs	sc .
										EHTR-FN

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Matrix: water						diddion.	Holding time exce	oudinoo ,	***************************************	Troiding Till
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : TDS by Gravimetry										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E162	28-Feb-2022					05-Mar-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE							I			
RG GHBP WS GGCAMP 2022-02-28 NP	E162	28-Feb-2022					05-Mar-2022	7 days	5 days	√
110_011B1 _110_000/1111 _2022-02-20_111	2.02	20 : 05 2022					00 Mai 2022	, dayo	o dayo	
Physical Tests : TDS by Gravimetry							I		I	
HDPE	F160	20 Fab 2022					05 Mar 2022	7 days	E days	1
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E162	28-Feb-2022					05-Mar-2022	7 days	5 days	•
Physical Tests : TDS by Gravimetry										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E162	28-Feb-2022					05-Mar-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E160-L	28-Feb-2022					05-Mar-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E160-L	28-Feb-2022					05-Mar-2022	7 days	5 days	✓
									,	
Dhysical Tests (TSS by Cusylmatin (Level aval)										
Physical Tests : TSS by Gravimetry (Low Level) HDPE									I	
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E160-L	28-Feb-2022					05-Mar-2022	7 days	5 days	1
NG_NVEN_WG_GGCANNF_2022-02-20_NF	L100-L	201052022					03-Wai-2022	r days	Juays	•
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE	F400:	00 5 1 0055					05.44 0000			
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E160-L	28-Feb-2022					05-Mar-2022	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E121	28-Feb-2022					02-Mar-2022	3 days	2 days	✓

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										Holding III
Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E121	28-Feb-2022					02-Mar-2022	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG RIVER WS GGCAMP 2022-02-28 NP	E121	28-Feb-2022					02-Mar-2022	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_TRIP_WS_GGCAMP_2022-02-28_NP	E121	28-Feb-2022					02-Mar-2022	3 days	2 days	√
110_1111 _110_0001111 _1022 02 20_111		20 : 32 2022					02 2022	o aayo		
T (I M (I) T (I O) (I) I M (I) O O O O O O O O O										
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)							I		I	
HDPE total (nitric acid) RG FBLANK WS GGCAMP 2022-02-28 NP	E420.Cr-L	28-Feb-2022					07-Mar-2022	400	7 days	1
RG_FBLANK_WS_GGCAWP_2022-02-20_NP	E420.GI-L	20-Feb-2022					07-IVIAI-2022	180	1 days	,
								days		
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)								1		
HDPE total (nitric acid)	5400 O I	00 5 1 0000								
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E420.Cr-L	28-Feb-2022					07-Mar-2022	180	7 days	✓
								days		
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E420.Cr-L	28-Feb-2022					07-Mar-2022	180	7 days	✓
								days		
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E508-L	28-Feb-2022					05-Mar-2022	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E508-L	28-Feb-2022					05-Mar-2022	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)								1	1	
Pre-cleaned amber glass - total (lab preserved)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E508-L	28-Feb-2022					05-Mar-2022	28 days	5 davs	✓
· · · · · · · · · · · · · · · · · · ·								1	,, .	

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Matrix: Water Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

										J
Analyte Group	Method	Method Sampling Date Extraction / Preparation		Analys						
Container / Client Sample ID(s)			Preparation	Holding	Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_FBLANK_WS_GGCAMP_2022-02-28_NP	E420	28-Feb-2022					07-Mar-2022	180	7 days	✓
								days		
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_GHBP_WS_GGCAMP_2022-02-28_NP	E420	28-Feb-2022					07-Mar-2022	180	7 days	✓
								days		
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_RIVER_WS_GGCAMP_2022-02-28_NP	E420	28-Feb-2022					07-Mar-2022	180	7 days	✓
								days		

Legend & Qualifier Definitions

 $\hbox{EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended}$

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type		•	С	ount		Frequency (%))
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	421378	1	20	5.0	5.0	1
Alkalinity Species by Titration	E290	421515	1	20	5.0	5.0	√
Ammonia by Fluorescence	E298	420943	1	15	6.6	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	420811	1	16	6.2	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	420812	1	16	6.2	5.0	<u> </u>
Conductivity in Water	E100	421514	1	20	5.0	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	425389	1	20	5.0	5.0	√
Dissolved Mercury in Water by CVAAS	E509	426361	1	20	5.0	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	425390	1	20	5.0	5.0	1
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	421012	1	12	8.3	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	421302	1	15	6.6	5.0	√
Fluoride in Water by IC	E235.F	420809	1	16	6.2	5.0	√
Nitrate in Water by IC (Low Level)	E235.NO3-L	420813	1	16	6.2	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	420814	1	16	6.2	5.0	1
ORP by Electrode	E125	426060	1	20	5.0	5.0	√
pH by Meter	E108	421513	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	420810	1	16	6.2	5.0	1
TDS by Gravimetry	E162	421874	1	20	5.0	5.0	√
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	425329	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	427209	2	40	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	425020	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	425330	2	20	10.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	421013	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	420883	1	17	5.8	5.0	1
Turbidity by Nephelometry	E121	421432	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	421378	1	20	5.0	5.0	1
Alkalinity Species by Titration	E290	421515	1	20	5.0	5.0	√
Ammonia by Fluorescence	E298	420943	1	15	6.6	5.0	√
Bromide in Water by IC (Low Level)	E235.Br-L	420811	1	16	6.2	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	420812	1	16	6.2	5.0	√
Conductivity in Water	E100	421514	1	20	5.0	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	425389	1	20	5.0	5.0	√
Dissolved Mercury in Water by CVAAS	E509	426361	1	20	5.0	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	425390	1	20	5.0	5.0	√
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	421012	1	12	8.3	5.0	<u>√</u>
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	421302	1	15	6.6	5.0	1

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Matrix: Water

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

Quality Control Sample Type

Quality Control Sample Type			Co	unt		Frequency (%)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	420809	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	420813	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	420814	1	16	6.2	5.0	✓
ORP by Electrode	E125	426060	1	20	5.0	5.0	✓
pH by Meter	E108	421513	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	420810	1	16	6.2	5.0	✓
TDS by Gravimetry	E162	421874	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	425329	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	427209	2	40	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	425020	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	425330	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	421013	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	420883	1	17	5.8	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	421870	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	421432	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	421378	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	421515	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	420943	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	420811	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	420812	1	16	6.2	5.0	✓
Conductivity in Water	E100	421514	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	425389	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	426361	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	425390	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	421012	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	421302	1	15	6.6	5.0	✓
Fluoride in Water by IC	E235.F	420809	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	420813	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	420814	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	420810	1	16	6.2	5.0	✓
TDS by Gravimetry	E162	421874	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	425329	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	427209	2	40	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	425020	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	425330	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	421013	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	420883	1	17	5.8	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	421870	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	421432	1	20	5.0	5.0	✓

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

Quality Control Sample Type			Co	ount		Frequency (%,)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	420943	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	420811	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	420812	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	425389	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	426361	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	425390	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	421012	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	421302	1	15	6.6	5.0	✓
Fluoride in Water by IC	E235.F	420809	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	420813	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	420814	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	420810	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	425329	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	427209	2	40	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	425020	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	425330	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	421013	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	420883	1	17	5.8	5.0	✓

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is
	O James Facilities			measured by immersion of a conductivity cell with platinum electrodes into a water
mili bu Makan	Calgary - Environmental	10/-4	ADUA 4500 H (sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted
	Calgary - Environmental			at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light
Taiblaity by Nophlolemony	LIZI	Water	74 11/12 100 B (mod)	scatter under defined conditions.
	Calgary - Environmental			Social dilasi delinod estidiatione.
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the
				platinum metal-reference electrode employed, measured in mV. For high accuracy test
	Calgary - Environmental			results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
	Calgary - Environmental			filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the
	Calgary - Environmental			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre
, ,				filter, with evaporation of the filtrate at $180 \pm 2^{\circ}$ C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental	147.4	EDA 000 4 (1)	
Chloride in Water by IC (Low Level)	E235.CI-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
, ,	2200.1		,	detection.
	Calgary - Environmental			
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
Nitrate is Metallical (Level 1991)	Calgary - Environmental	147.4	EDA 000 4 (*** 1)	
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
ĺ			, ,	detection.
	Calgary - Environmental			
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Outrom Francisco			
	Calgary - Environmental			

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

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	АРНА 3030В	Water samples are filtered (0.45 um), and preserved with HNO3.

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



QUALITY CONTROL REPORT

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Client : Teck Coal Limited Laboratory : Calgary - Environmental
Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets

: 421 Pine Ave Address : 2559 29th Street NE

Sparwood BC Canada Calgary, Alberta Canada T1Y 7B5
---Telephone :+1 403 407 1800

Telephone :---- Telephone :+1 403 407 1800

Project :REGIONAL EFFECTS PROGRAM Date Samples Received :01-Mar-2022 09:21

PO : VPO00748510 Date Analysis Commenced : 01-Mar-2022

C-O-C number : February GGCAMP 2022 Issue Date :11-Mar-2022 17:45

Sampler : ---Site : ----

Quote number : Teck Coal Master Quote

No. of samples analysed 4

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

This Quality Control Report contains the following information:

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Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits

- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

No. of samples received

Address

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

Signatories	Position	Laboratory Department
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta

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Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percentage Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

ub-Matrix: Water							Labora	ntory Duplicate (D	иг) кероп		
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Physical Tests (QC	,										
CG2202276-002	Anonymous	acidity (as CaCO3)		E283	2.0	mg/L	37.4	36.1	3.70%	20%	
Physical Tests (QC	Lot: 421432)										
CG2202272-001	Anonymous	turbidity		E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	
Physical Tests (QC	Lot: 421513)										
CG2202271-001	Anonymous	pH		E108	0.10	pH units	7.96	7.97	0.126%	4%	
hysical Tests (QC	Lot: 421514)										
G2202271-001	Anonymous	conductivity		E100	2.0	μS/cm	2790	2790	0.00%	10%	
hysical Tests (QC	Lot: 421515)										
G2202271-001	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	441	440	0.136%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	441	440	0.136%	20%	
hysical Tests (QC	L of: 421874)										
G2202275-008	Anonymous	solids, total dissolved [TDS]		E162	40	mg/L	1630	1700	4.21%	20%	
Physical Tests (QC	: Lot: 426060)										
CG2202275-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	462	460	0.564%	15%	
Anions and Nutrion	its (QC Lot: 420809)										
CG2201584-005	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.146	0.145	0.0002	Diff <2x LOR	
	,					9.=		*****			
CG2201584-005	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	407	403	1.06%	20%	
	,	Sunate (as 504)	14000 70 0	2200.004	1.00	mg/L	407	400	1.0070	2070	
Anions and Nutrien CG2201584-005	ts (QC Lot: 420811) Anonymous	bromide	24959-67-9	E235.Br-L	0.250	ma/l	<0.250	<0.250	0	Diff <2x LOR	
	,	bromide	24959-07-9	E235.BI-L	0.250	mg/L	\0.250	~0.230	0	DIII \ZX LOR	
Anions and Nutrien CG2201584-005	its (QC Lot: 420812)		10007.00.0	5005 OLL	0.50	//	44.0	44.0	0.000/	000/	ı
JG2201584-005	Anonymous	chloride	16887-00-6	E235.CI-L	0.50	mg/L	11.9	11.6	2.96%	20%	
	ts (QC Lot: 420813)										
G2201584-005	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	21.0	20.7	1.16%	20%	
	ts (QC Lot: 420814)										
CG2201584-005	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 420883)										
CG2202276-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0039	0.0039	0.00002	Diff <2x LOR	

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Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Anions and Nutrier	nts (QC Lot: 420943) - co	ontinued									
CG2202276-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	
Anions and Nutrier	nts (QC Lot: 421302)										
CG2202276-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0036	0.0040	0.0004	Diff <2x LOR	
Anions and Nutrier	nts (QC Lot: 427209)										
CG2202264-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.326	0.322	0.004	Diff <2x LOR	
Anions and Nutrier	nts (QC Lot: 427393)										
CG2202277-004	RG_TRIP_WS_GGCAMP_ 2022-02-28_NP	Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 42101	2)									
CG2202277-001	RG_FBLANK_WS_GGCA MP_2022-02-28_NP	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 42101	3)									
CG2202277-001	RG_FBLANK_WS_GGCA MP_2022-02-28_NP	carbon, total organic [TOC]		E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Total Metals (QC L	ot: 425020)										
CG2201847-001	Anonymous	mercury, total	7439-97-6	E508-L	0.50	ng/L	<0.50	<0.50	0	Diff <2x LOR	
Total Metals (QC L	.ot: 425329)										
CG2202276-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
Total Metals (QC L	ot: 425330)										
CG2202276-001	Anonymous	copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	
		iron, total	7439-89-6	E420	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.0392	0.0402	2.38%	20%	
CG2202276-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00045	0.00044	0.000006	Diff <2x LOR	
		arsenic, total	7440-38-2	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0549	0.0562	2.33%	20%	
		beryllium, total	7440-41-7	E420	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		boron, total	7440-42-8	E420	0.020	mg/L	0.031	0.031	0.00006	Diff <2x LOR	
		cadmium, total	7440-43-9	E420	0.0100	mg/L	0.786 µg/L	0.000798	1.54%	20%	
		calcium, total	7440-70-2	E420	0.100	mg/L	408	411	0.630%	20%	
		cobalt, total	7440-48-4	E420	0.20	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	
		lead, total	7439-92-1	E420	0.000100	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	
		,	7439-92-1	E420	0.0020	-	0.215	0.208	3.29%	20%	
		lithium, total				mg/L				20%	
		magnesium, total	7439-95-4	E420	0.0100	mg/L	198	201	1.49%		
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.00038	<0.00020	0.00018	Diff <2x LOR	
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.00144	0.00136	5.41%	20%	

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ub-Matrix: Water					Laboratory Duplicate (DUP) Report						
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
otal Metals (QC Lo	ot: 425330) - continued										
CG2202276-001	Anonymous	potassium, total	7440-09-7	E420	0.100	mg/L	5.68	5.76	1.53%	20%	
		selenium, total	7782-49-2	E420	0.100	mg/L	388 µg/L	0.403	3.96%	20%	
		silicon, total	7440-21-3	E420	0.20	mg/L	2.16	2.19	1.61%	20%	
		silver, total	7440-22-4	E420	0.000020	mg/L	0.000034	0.000022	0.000012	Diff <2x LOR	
		sodium, total	7440-23-5	E420	0.100	mg/L	9.38	9.57	1.98%	20%	
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.367	0.367	0.0424%	20%	
		sulfur, total	7704-34-9	E420	1.00	mg/L	337	337	0.0954%	20%	
		thallium, total	7440-28-0	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0164	0.0168	2.40%	20%	
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.0148	0.0155	0.0007	Diff <2x LOR	
issolved Metals (0	QC Lot: 425389)										
G2202276-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
issolved Metals (QC Lot: 425390)										
CG2202276-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0062	0.0053	0.0010	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00044	0.00042	0.00002	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0618	0.0634	2.48%	20%	
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.031	0.030	0.001	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	0.824 μg/L	0.000792	3.95%	20%	
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	444	450	1.33%	20%	
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.217	0.221	1.82%	20%	
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	200	205	2.19%	20%	
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.00039	0.00042	0.00002	Diff <2x LOR	
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00150	0.00153	2.32%	20%	
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.0356	0.0367	2.86%	20%	

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 Client
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Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 425390) - contin	ued									
CG2202276-001	Anonymous	selenium, dissolved	7782-49-2	E421	0.100	mg/L	415 μg/L	0.419	1.05%	20%	
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	2.21	2.30	4.10%	20%	
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	
		sodium, dissolved	7440-23-5	E421	0.100	mg/L	9.70	9.89	1.98%	20%	
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.389	0.390	0.351%	20%	
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	364	370	1.62%	20%	
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000021	<0.000020	0.000001	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0164	0.0166	1.06%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0168	0.0175	0.0006	Diff <2x LOR	
Dissolved Metals (0	QC Lot: 426361)										
CG2202216-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.000050	0	Diff <2x LOR	

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Method Blank (MB) Report

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

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 421378)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 421432)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 421514)					
conductivity	E100	1	μS/cm	1.3	
Physical Tests (QCLot: 421515)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 421870)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 421874)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 420809)					
fluoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 420810)					
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 420811)					
bromide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 420812)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 420813)					
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 420814)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 420883)					
phosphorus, total	7723-14-0 E372-U	0.002	mg/L	<0.0020	
Anions and Nutrients (QCLot: 420943)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 421302)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 427209)					
anons and Nathents (QOLOL 42/203)					

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 427209					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 427393					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Organic / Inorganic Carbon (QCLot: 4					
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot: 4					
carbon, total organic [TOC]	E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 425020)					
mercury, total	7439-97-6 E508-L	0.5	ng/L	<0.50	
Total Metals (QCLot: 425329)					
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 425330)					
aluminum, total	7429-90-5 E420	0.003	mg/L	<0.0030	
antimony, total	7440-36-0 E420	0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2 E420	0.0001	mg/L	<0.00010	
parium, total	7440-39-3 E420	0.0001	mg/L	<0.00010	
peryllium, total	7440-41-7 E420	0.00002	mg/L	<0.000020	
pismuth, total	7440-69-9 E420	0.00005	mg/L	<0.000050	
poron, total	7440-42-8 E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9 E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2 E420	0.05	mg/L	<0.050	
cobalt, total	7440-48-4 E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8 E420	0.0005	mg/L	<0.00050	
ron, total	7439-89-6 E420	0.01	mg/L	<0.010	
lead, total	7439-92-1 E420	0.00005	mg/L	<0.000050	
ithium, total	7439-93-2 E420	0.001	mg/L	<0.0010	
magnesium, total	7439-95-4 E420	0.005	mg/L	<0.0050	
manganese, total	7439-96-5 E420	0.0001	mg/L	<0.00010	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	<0.000050	
nickel, total	7440-02-0 E420	0.0005	mg/L	<0.00050	
ootassium, total	7440-09-7 E420	0.05	mg/L	<0.050	
selenium, total	7782-49-2 E420	0.00005	mg/L	<0.000050	
silicon, total	7440-21-3 E420	0.1	mg/L	<0.10	
silver, total	7440-22-4 E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5 E420	0.05	mg/L	<0.050	
strontium, total	7440-24-6 E420	0.0002	mg/L	<0.00020	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 425330) - co	ntinued				
sulfur, total	7704-34-9 E420	0.5	mg/L	<0.50	
thallium, total	7440-28-0 E420	0.00001	mg/L	<0.000010	
tin, total	7440-31-5 E420	0.0001	mg/L	<0.00010	
titanium, total	7440-32-6 E420	0.0003	mg/L	<0.00030	
uranium, total	7440-61-1 E420	0.00001	mg/L	<0.000010	
vanadium, total	7440-62-2 E420	0.0005	mg/L	<0.00050	
zinc, total	7440-66-6 E420	0.003	mg/L	<0.0030	
Dissolved Metals (QCLot: 425389)					
chromium, dissolved	7440-47-3 E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 425390)					
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	<0.00010	
parium, dissolved	7440-39-3 E421	0.0001	mg/L	<0.00010	
eryllium, dissolved	7440-41-7 E421	0.00002	mg/L	<0.000020	
sismuth, dissolved	7440-69-9 E421	0.00005	mg/L	<0.000050	
oron, dissolved	7440-42-8 E421	0.01	mg/L	<0.010	
admium, dissolved	7440-43-9 E421	0.000005	mg/L	<0.0000050	
alcium, dissolved	7440-70-2 E421	0.05	mg/L	<0.050	
obalt, dissolved	7440-48-4 E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8 E421	0.0002	mg/L	<0.00020	
on, dissolved	7439-89-6 E421	0.01	mg/L	<0.010	
ead, dissolved	7439-92-1 E421	0.00005	mg/L	<0.000050	
thium, dissolved	7439-93-2 E421	0.001	mg/L	<0.0010	
magnesium, dissolved	7439-95-4 E421	0.005	mg/L	<0.0050	
manganese, dissolved	7439-96-5 E421	0.0001	mg/L	<0.00010	
nolybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	<0.00050	
ootassium, dissolved	7440-09-7 E421	0.05	mg/L	<0.050	
elenium, dissolved	7782-49-2 E421	0.00005	mg/L	<0.000050	
ilicon, dissolved	7440-21-3 E421	0.05	mg/L	<0.050	
silver, dissolved	7440-22-4 E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5 E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9 E421	0.5	mg/L	<0.50	
thallium, dissolved	7440-28-0 E421	0.00001	mg/L	<0.000010	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 425390) - c	ontinued					
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	
Dissolved Metals (QCLot: 426361)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water		Laboratory Control Sample (LCS) Report						
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 421378)								
acidity (as CaCO3)	E283	2	mg/L	50 mg/L	106	85.0	115	
Physical Tests (QCLot: 421432)								
turbidity	E121	0.1	NTU	200 NTU	94.6	85.0	115	
Physical Tests (QCLot: 421513)								
рН	E108		pH units	7 pH units	100	98.6	101	
Physical Tests (QCLot: 421514)								
conductivity	E100	1	μS/cm	146.9 μS/cm	101	90.0	110	
Physical Tests (QCLot: 421515)								
alkalinity, total (as CaCO3)	E290	1	mg/L	500 mg/L	103	85.0	115	
Physical Tests (QCLot: 421870)								
solids, total suspended [TSS]	E160-L	1	mg/L	150 mg/L	102	85.0	115	
Physical Tests (QCLot: 421874)								
solids, total dissolved [TDS]	E162	10	mg/L	1000 mg/L	91.6	85.0	115	
Physical Tests (QCLot: 426060)								
oxidation-reduction potential [ORP]	E125		mV	220 mV	101	95.4	104	
Anions and Nutrients (QCLot: 420809)								
fluoride	16984-48-8 E235.F	0.02	mg/L	1 mg/L	93.3	90.0	110	
Anions and Nutrients (QCLot: 420810)								
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 420811)								
bromide	24959-67-9 E235.Br-L	0.05	mg/L	0.5 mg/L	100	85.0	115	
Anions and Nutrients (QCLot: 420812)								
chloride	16887-00-6 E235.CI-L	0.1	mg/L	100 mg/L	98.3	90.0	110	
Anions and Nutrients (QCLot: 420813)								
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	2.5 mg/L	99.5	90.0	110	
Anions and Nutrients (QCLot: 420814)								
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	
Anions and Nutrients (QCLot: 420883)								
phosphorus, total	7723-14-0 E372-U	0.002	mg/L	8.02 mg/L	100	80.0	120	
Anions and Nutrients (QCLot: 420943)								
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	0.2 mg/L	96.5	85.0	115	

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Sub-Matrix: Water	Laboratory Control Sample (LCS) Report							
				Spike	Recovery (%)		y Limits (%)	
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 421302) - co	ontinued							
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	0.02 mg/L	93.8	80.0	120	
Anions and Nutrients (QCLot: 427209)								
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	4 mg/L	96.2	75.0	125	
Anions and Nutrients (QCLot: 427393)								
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	4 mg/L	97.9	75.0	125	
Organic / Inorganic Carbon (QCLot: 421012	2)							
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	8.57 mg/L	104	80.0	120	
Organic / Inorganic Carbon (QCLot: 421013	3)							
carbon, total organic [TOC]	E355-L	0.5	mg/L	8.57 mg/L	111	80.0	120	
Total Metals (QCLot: 425020)								'
mercury, total	7439-97-6 E508-L	0.5	ng/L	5 ng/L	104	80.0	120	
Total Metals (QCLot: 425329)								
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	0.25 mg/L	95.8	80.0	120	
Total Metals (QCLot: 425330)								
aluminum, total	7429-90-5 E420	0.003	mg/L	2 mg/L	93.2	80.0	120	
antimony, total	7440-36-0 E420	0.0001	mg/L	1 mg/L	104	80.0	120	
arsenic, total	7440-38-2 E420	0.0001	mg/L	1 mg/L	96.3	80.0	120	
barium, total	7440-39-3 E420	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	
beryllium, total	7440-41-7 E420	0.00002	mg/L	0.1 mg/L	97.6	80.0	120	
bismuth, total	7440-69-9 E420	0.00005	mg/L	1 mg/L	97.9	80.0	120	
boron, total	7440-42-8 E420	0.01	mg/L	1 mg/L	96.7	80.0	120	
cadmium, total	7440-43-9 E420	0.000005	mg/L	0.1 mg/L	94.9	80.0	120	
calcium, total	7440-70-2 E420	0.05	mg/L	50 mg/L	99.8	80.0	120	
cobalt, total	7440-48-4 E420	0.0001	mg/L	0.25 mg/L	96.0	80.0	120	
copper, total	7440-50-8 E420	0.0005	mg/L	0.25 mg/L	95.6	80.0	120	
iron, total	7439-89-6 E420	0.01	mg/L	1 mg/L	98.3	80.0	120	
lead, total	7439-92-1 E420	0.00005	mg/L	0.5 mg/L	95.9	80.0	120	
lithium, total	7439-93-2 E420	0.001	mg/L	0.25 mg/L	102	80.0	120	
magnesium, total	7439-95-4 E420	0.005	mg/L	50 mg/L	95.5	80.0	120	
manganese, total	7439-96-5 E420	0.0001	mg/L	0.25 mg/L	97.8	80.0	120	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	
nickel, total	7440-02-0 E420	0.0005	mg/L	0.5 mg/L	96.4	80.0	120	
potassium, total	7440-09-7 E420	0.05	mg/L	50 mg/L	102	80.0	120	
selenium, total	7782-49-2 E420	0.00005	mg/L	1 mg/L	92.4	80.0	120	
silicon, total	7440-21-3 E420	0.1	mg/L	10 mg/L	97.7	80.0	120	

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Sub-Matrix: Water					Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	/ Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Total Metals (QCLot: 425330) - conti	nued										
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	92.6	80.0	120			
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	97.0	80.0	120			
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	95.1	80.0	120			
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	109	80.0	120			
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	100	80.0	120			
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	95.7	80.0	120			
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.5	80.0	120			
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	95.8	80.0	120			
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	95.4	80.0	120			
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.3	80.0	120			
Dissolved Metals (QCLot: 425389)											
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120			
Dissolved Metals (QCLot: 425390)											
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	109	80.0	120			
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120			
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120			
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120			
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	108	80.0	120			
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.8	80.0	120			
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	102	80.0	120			
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120			
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120			
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120			
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120			
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	92.8	80.0	120			
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	104	80.0	120			
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	105	80.0	120			
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	103	80.0	120			
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120			
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	104	80.0	120			
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120			
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120			
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	103	80.0	120			
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	80.0	120			
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	94.2	80.0	120			
sodium, dissolved	7440-23-5		0.05	mg/L	50 mg/L	104	80.0	120			
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Sub-Matrix: Water	ıb-Matrix: Water						Laboratory Control Sample (LCS) Report						
					Spike Recovery (%) Recovery Limits			Limits (%)					
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier				
Dissolved Metals (QCLot: 425390) - co	ontinued												
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120					
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	91.0	80.0	120					
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	106	80.0	120					
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.1	80.0	120					
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120					
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	103	80.0	120					
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120					
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	88.8	80.0	120					
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120					

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 Client
 : Teck Coal Lie

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

Sub-Matrix: Water				Matrix Spike (MS) Report						
					Spi	ike	Recovery (%)	Limits (%)		
aboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie
	ents (QCLot: 420809)									
CG2202277-001	RG_FBLANK_WS_GGCAM P 2022-02-28 NP	fluoride	16984-48-8	E235.F	0.871 mg/L	1 mg/L	87.1	75.0	125	
Anions and Nutri	ents (QCLot: 420810)									
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	sulfate (as SO4)	14808-79-8	E235.SO4	95.8 mg/L	100 mg/L	95.8	75.0	125	
Anions and Nutri	ents (QCLot: 420811)									
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	bromide	24959-67-9	E235.Br-L	0.488 mg/L	0.5 mg/L	97.7	75.0	125	
Anions and Nutri	ents (QCLot: 420812)									
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	chloride	16887-00-6	E235.CI-L	95.1 mg/L	100 mg/L	95.1	75.0	125	
Anions and Nutri	ents (QCLot: 420813)									
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	nitrate (as N)	14797-55-8	E235.NO3-L	2.41 mg/L	2.5 mg/L	96.4	75.0	125	
Anions and Nutri	ents (QCLot: 420814)									
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.488 mg/L	0.5 mg/L	97.6	75.0	125	
Anions and Nutri	ents (QCLot: 420883)									
CG2202276-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0658 mg/L	0.0676 mg/L	97.3	70.0	130	
Anions and Nutri	ents (QCLot: 420943)									
CG2202276-003	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.103 mg/L	0.1 mg/L	103	75.0	125	
Anions and Nutri	ents (QCLot: 421302)									
CG2202276-003	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0532 mg/L	0.05 mg/L	106	70.0	130	
Anions and Nutri	ents (QCLot: 427209)									
CG2202264-002	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.74 mg/L	2.5 mg/L	110	70.0	130	
Anions and Nutri	ents (QCLot: 427393)									
CG2202280-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.54 mg/L	2.5 mg/L	102	70.0	130	
Organic / Inorga	nic Carbon (QCLot: 4210	012)								
CG2202277-001	RG_FBLANK_WS_GGCAM P 2022-02-28 NP	carbon, dissolved organic [DOC]		E358-L	5.30 mg/L	5 mg/L	106	70.0	130	

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ub-Matrix: Water					Matrix Spike (MS) Report					
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
aboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie
rganic / Inorga	nic Carbon (QCLot: 4210	013) - continued								
CG2202277-001	RG_FBLANK_WS_GGCAM P_2022-02-28_NP	carbon, total organic [TOC]		E355-L	5.38 mg/L	5 mg/L	108	70.0	130	
otal Metals (QC	CLot: 425020)									
CG2201847-002	Anonymous	mercury, total	7439-97-6	E508-L	5.15 ng/L	5 ng/L	103	70.0	130	
otal Metals (QC	Lot: 425329)									
CG2202276-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0772 mg/L	0.08 mg/L	96.5	70.0	130	
otal Metals (QC	CLot: 425330)									
CG2202276-002	Anonymous	aluminum, total	7429-90-5	E420	0.380 mg/L	0.4 mg/L	94.9	70.0	130	
		antimony, total	7440-36-0	E420	0.0418 mg/L	0.04 mg/L	104	70.0	130	
		arsenic, total	7440-38-2	E420	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	
		beryllium, total	7440-41-7	E420	0.0780 mg/L	0.08 mg/L	97.4	70.0	130	
		bismuth, total	7440-69-9	E420	0.0180 mg/L	0.02 mg/L	90.0	70.0	130	
		boron, total	7440-42-8	E420	0.199 mg/L	0.2 mg/L	99.4	70.0	130	
		cadmium, total	7440-43-9	E420	0.00752 mg/L	0.008 mg/L	94.0	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.0374 mg/L	0.04 mg/L	93.6	70.0	130	
		copper, total	7440-50-8	E420	0.0366 mg/L	0.04 mg/L	91.5	70.0	130	
		iron, total	7439-89-6	E420	3.84 mg/L	4 mg/L	96.0	70.0	130	
		lead, total	7439-92-1	E420	0.0370 mg/L	0.04 mg/L	92.5	70.0	130	
		lithium, total	7439-93-2	E420	ND mg/L	0.1 mg/L	ND	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	0.0381 mg/L	0.04 mg/L	95.4	70.0	130	
		molybdenum, total	7439-98-7	E420	0.0440 mg/L	0.04 mg/L	110	70.0	130	
		nickel, total	7440-02-0	E420	0.0747 mg/L	0.08 mg/L	93.4	70.0	130	
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	
		silicon, total	7440-21-3	E420	18.3 mg/L	20 mg/L	91.4	70.0	130	
		silver, total	7440-22-4	E420	0.00800 mg/L	0.008 mg/L	100.0	70.0	130	
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	
		thallium, total	7440-28-0	E420	0.00748 mg/L	0.008 mg/L	93.5	70.0	130	
		tin, total	7440-31-5	E420	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	
		titanium, total	7440-32-6	E420	0.0841 mg/L	0.08 mg/L	105	70.0	130	
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	

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: Teck Coal Limited





Sub-Matrix: Water				Matrix Spike (MS) Report						
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QC	Lot: 425330) - contin	ued								
CG2202276-002	Anonymous	vanadium, total	7440-62-2	E420	0.197 mg/L	0.2 mg/L	98.6	70.0	130	
		zinc, total	7440-66-6	E420	0.760 mg/L	0.8 mg/L	95.0	70.0	130	
Dissolved Metals	(QCLot: 425389)									
CG2202276-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0809 mg/L	0.08 mg/L	101	70.0	130	
Dissolved Metals	(QCLot: 425390)									
CG2202276-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.390 mg/L	0.4 mg/L	97.6	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.0429 mg/L	0.04 mg/L	107	70.0	130	
		barium, dissolved	7440-39-3	E421	ND mg/L	0.04 mg/L	ND	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.0734 mg/L	0.08 mg/L	91.7	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.0150 mg/L	0.02 mg/L	75.0	70.0	130	
		boron, dissolved	7440-42-8	E421	0.181 mg/L	0.2 mg/L	90.6	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.00801 mg/L	0.008 mg/L	100	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	
		copper, dissolved	7440-50-8	E421	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	
		iron, dissolved	7439-89-6	E421	3.89 mg/L	4 mg/L	97.4	70.0	130	
		lead, dissolved	7439-92-1	E421	0.0341 mg/L	0.04 mg/L	85.2	70.0	130	
		lithium, dissolved	7439-93-2	E421	ND mg/L	0.1 mg/L	ND	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.0750 mg/L	0.08 mg/L	93.7	70.0	130	
		potassium, dissolved	7440-09-7	E421	7.86 mg/L	8 mg/L	98.3	70.0	130	
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	
		silicon, dissolved	7440-21-3	E421	18.7 mg/L	20 mg/L	93.3	70.0	130	
		silver, dissolved	7440-22-4	E421	0.00737 mg/L	0.008 mg/L	92.1	70.0	130	
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.00693 mg/L	0.008 mg/L	86.6	70.0	130	
		tin, dissolved	7440-31-5	E421	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.0815 mg/L	0.08 mg/L	102	70.0	130	
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	
		vanadium, dissolved	7440-62-2	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	
		zinc, dissolved	7440-66-6	E421	0.805 mg/L	0.8 mg/L	101	70.0	130	

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Sub-Matrix: Water					Matrix Spike (MS) Report						
					Spi	ke	Recovery (%)	Recovery	Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier	
Dissolved Metals	(QCLot: 426361)										
CG2202216-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000904 mg/L	0.0001 mg/L	90.4	70.0	130		



CERTIFICATE OF ANALYSIS

Work Order : CG2212274

Client : Teck Coal Limited

Contact : Giovanna Diaz
Address : 421 Pine Avenu

ess : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ---

Project : REGIONAL EFFECT PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer I.

Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 10-Sep-2022 11:45

Date Analysis Commenced : 11-Sep-2022

Issue Date : 15-Sep-2022 16:02

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Dwayne Bennett	Supervisor - Inorganic	Metals, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sara Niroomand		Metals, Calgary, Alberta

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General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Workorder Comments

We did not receive any samples for Sample ID RG_GHNF_WS_LAEMP_GC_2022-09_N

Qualifiers

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
	Conductivity.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

>: greater than.

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Work Order : CG2212274
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water			C	lient sample ID	RG_GHFF_WS_	 	
(Matrix: Water)					LAEMP_GC_20 22-09_N		
			Client samp	oling date / time	08-Sep-2022	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212274-001	 	
					Result	 	
Physical Tests							
acidity (as CaCO3)		E283	2.0	mg/L	<2.0	 	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	274	 	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	334	 	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	 	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	 	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	 	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	274	 	
conductivity		E100	2.0	μS/cm	1710	 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	1230	 	
oxidation-reduction potential [ORP]		E125	0.10	mV	236	 	
pH		E108	0.10	pH units	8.17	 	
solids, total dissolved [TDS]		E162	10	mg/L	1450	 	
solids, total suspended [TSS]		E160-L	1.0	mg/L	5.1	 	
turbidity		E121	0.10	NTU	0.50	 	
Anions and Nutrients							
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	2.24	 	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.195	 	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.393 TKNI	 	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.17	 	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS	 	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	 	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0052	 	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	932	 	
Organic / Inorganic Carbon							
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.33	 	
carbon, total organic [TOC]		E355-L	0.50	mg/L	1.39	 	
Ion Balance							

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Work Order : CG2212274
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water			Cl	ient sample ID	RG_GHFF_WS_	 	
(Matrix: Water)					LAEMP_GC_20 22-09_N		
			Client samp	ling date / time	08-Sep-2022	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212274-001	 	
					Result	 	
Ion Balance							
anion sum		EC101	0.10	meq/L	25.4	 	
cation sum		EC101	0.10	meq/L	24.7	 	
ion balance (cations/anions)		EC101	0.010	%	97.2	 	
ion balance (APHA)		EC101	0.010	%	1.40	 	
Total Metals							
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0070	 	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00046	 	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00025	 	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0484	 	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	 	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	 	
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	 	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0056	 	
calcium, total	7440-70-2	E420	0.050	mg/L	209	 	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00014	 	
cobalt, total	7440-48-4	E420	0.10	μg/L	<0.10	 	
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	 	
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	 	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	 	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0206	 	
magnesium, total	7439-95-4	E420	0.0050	mg/L	174	 	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00102	 	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	 	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00164	 	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0133	 	
potassium, total	7440-09-7	E420	0.050	mg/L	2.62	 	
selenium, total	7782-49-2	E420	0.050	μg/L	196	 	
silicon, total	7440-21-3	E420	0.10	mg/L	4.03	 	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	 	
sodium, total	7440-23-5	E420	0.050	mg/L	2.57	 	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.211	 	
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Work Order : CG2212274
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water			Cli	ient sample ID	RG_GHFF_WS_	 		
(Matrix: Water)					LAEMP_GC_20 22-09_N			
			Client samp	ling date / time	08-Sep-2022	 		
Analyte	CAS Number	Method	LOR	Unit	CG2212274-001	 		
					Result	 		
Total Metals								
sulfur, total	7704-34-9	E420	0.50	mg/L	294	 		
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	 		
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	 		
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	 		
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00927	 		
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00056	 		
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	 		
Dissolved Metals								
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0029	 		
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00045	 		
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00020 DLDS	 		
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0483	 		
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.040 DLDS	 		
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000100 DLDS	 		
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.020 DLDS	 		
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	<0.0100 DLDS	 		
calcium, dissolved	7440-70-2	E421	0.050	mg/L	202	 		
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00020 DLDS	 		
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.20 DLDS	 		
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00040 DLDS	 		
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.020 DLDS	 		
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000100 DLDS	 		
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0211	 		
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	176	 		
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00088	 		
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.000050	 		
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00165	 		
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.0130	 		
potassium, dissolved	7440-02-0	E421	0.050	mg/L	2.46	 		
selenium, dissolved	7782-49-2	E421	0.050	μg/L	194	 		
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.73	 		
Januari, dissolved	1440-21-3	L 121	0.500	mg/L	5.70		1	

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Client : Teck Coal Limited

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Analytical Results

Sub-Matrix: Water (Matrix: Water)			CI	ient sample ID	RG_GHFF_WS_ LAEMP_GC_20 22-09_N	 	
			Client samp	ling date / time	08-Sep-2022	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212274-001	 	
					Result	 	
Dissolved Metals							
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000020 DLDS	 	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.32	 	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.201	 	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	330	 	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000020 DLDS	 	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00020 DLDS	 	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00060 DLDS	 	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00927	 	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00100 DLDS	 	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0020 DLDS	 	
dissolved mercury filtration location		EP509	-	-	Field	 	
dissolved metals filtration location		EP421	-	-	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2212274** Page : 1 of 12

 Client
 : Teck Coal Limited
 Laboratory
 : Calgary - Environmental

 Contact
 : Giovanna Diaz
 Account Manager
 : Lyudmyla Shvets

: 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

 Telephone
 : --- Telephone
 : +1 403 407 1800

 Project
 : REGIONAL EFFECT PROGRAM
 Date Samples Received
 : 10-Sep-2022 11:45

Sampler : Jennifer I.

Site · ----

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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

Key

Address

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers: Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



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Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					Eva	aluation: × =	Holding time exce	edance ; 🔻	= Within	Holding Time
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_GHFF_WS_LAEMP_GC_2022-09_N	E298	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.Br-L	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.CI-L	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	~
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Le	vel 0.001									
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E378-U	08-Sep-2022	11-Sep-2022				11-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.F	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	√
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.NO3-L	08-Sep-2022	11-Sep-2022	3 days	3 days	√	11-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.NO2-L	08-Sep-2022	11-Sep-2022				11-Sep-2022	3 days	3 days	✓

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Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

water					LV	aluation. * =	Holding time exce	euance, •	- vvitiiiii	r rolaling in
Analyte Group	Method	Sampling Date	Ex	traction / Pi	reparation					
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E235.SO4	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E318	08-Sep-2022	12-Sep-2022				12-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E372-U	08-Sep-2022	12-Sep-2022				13-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE - dissolved (lab preserved)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E421.Cr-L	08-Sep-2022	12-Sep-2022				13-Sep-2022	180	6 days	✓
								days		
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E509	08-Sep-2022	12-Sep-2022				12-Sep-2022	28 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)	F 404		40.0				40.0 0000			
RG_GHFF_WS_LAEMP_GC_2022-09_N	E421	08-Sep-2022	12-Sep-2022				13-Sep-2022	180	6 days	~
								days		
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Lev	vel)									
Amber glass dissolved (sulfuric acid)	E358-L	08-Sep-2022	11 Can 2022				11 Con 2022	28 days	2 40.40	1
RG_GHFF_WS_LAEMP_GC_2022-09_N	E336-L	06-3ep-2022	11-Sep-2022				11-Sep-2022	20 days	3 days	,
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combust	ion (Low Level)						I	I		
Amber glass total (sulfuric acid) RG_GHFF_WS_LAEMP_GC_2022-09_N	E355-L	08-Sep-2022	11-Sep-2022				11-Sep-2022	28 days	3 days	✓
1/0_01111 _VV0_LAEIVIF_0C_2022-09_IV	L333-L	00-3 c p-2022	11-0 c p-2022				11-06p-2022	20 days	Juays	,
Physical Tests : Asidity by Titystian										
Physical Tests : Acidity by Titration HDPE										
RG GHFF WS LAEMP GC 2022-09 N	E283	08-Sep-2022	12-Sep-2022				12-Sep-2022	14 days	4 davs	1
· · · _ · · · · · · · · · · · · · · · ·				T.	1					

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Project : REGIONAL EFFECT PROGRAM



Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

Matrix: water						araation.	nolding time exce	oudilloo ,	· · · · · · · · · · · · · · · · · · ·	r r rolainig i ili
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation					
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual		-	Rec	Actual	•
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E290	08-Sep-2022	12-Sep-2022				12-Sep-2022	14 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
RG GHFF WS LAEMP GC 2022-09 N	E100	08-Sep-2022	12-Sep-2022				12-Sep-2022	28 days	4 days	✓
			·				·		,	
Physical Tests : ORP by Electrode										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E125	08-Sep-2022					12-Sep-2022	0.25	108 hrs	×
							·	hrs		EHTR-FM
Physical Tests : pH by Meter										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E108	08-Sep-2022	12-Sep-2022				12-Sep-2022	0.25	0.26	3c
102411121111111111111111111111111111111		' ' '	,				' '	hrs	hrs	EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E162	08-Sep-2022					13-Sep-2022	7 days	6 days	1
									,	
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E160-L	08-Sep-2022					13-Sep-2022	7 days	6 days	1
							·			
Physical Tests : Turbidity by Nephelometry							L			
HDPE										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E121	08-Sep-2022					11-Sep-2022	3 days	3 days	1
							' '	,	,	
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE - total (lab preserved)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E420.Cr-L	08-Sep-2022	12-Sep-2022				13-Sep-2022	180	6 days	✓
1.0_000_200_2322 33_1		33 34 232						days	,-	
Total Metals : Total Mercury in Water by CVAAS								,-		
Glass vial total (hydrochloric acid)										
RG_GHFF_WS_LAEMP_GC_2022-09_N	E508	08-Sep-2022	12-Sep-2022				12-Sep-2022	28 days	4 days	1
RG GHEE WS LAEMP GC 2022-09 N										

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Client : Teck Coal Limited

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Matrix: Water Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Ext							
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GHFF_WS_LAEMP_GC_2022-09_N	E420	08-Sep-2022	12-Sep-2022				13-Sep-2022	180 days	6 days	✓

Legend & Qualifier Definitions

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

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			Co	ount		Frequency (%))
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	642501	1	17	5.8	5.0	1
Alkalinity Species by Titration	E290	642497	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	641825	1	16	6.2	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	641957	1	15	6.6	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	641958	1	15	6.6	5.0	1
Conductivity in Water	E100	642496	1	17	5.8	5.0	1
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	643704	1	16	6.2	5.0	1
Dissolved Mercury in Water by CVAAS	E509	642719	1	17	5.8	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	643705	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	641869	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	641921	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	641956	1	15	6.6	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	641959	1	19	5.2	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	641960	1	19	5.2	5.0	✓
ORP by Electrode	E125	641962	1	15	6.6	5.0	✓
pH by Meter	E108	642495	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	641961	1	15	6.6	5.0	1
TDS by Gravimetry	E162	645182	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	643302	1	16	6.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	642132	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	642722	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	643301	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	641870	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	642658	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	641757	1	17	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	642501	1	17	5.8	5.0	1
Alkalinity Species by Titration	E290	642497	1	17	5.8	5.0	1
Ammonia by Fluorescence	E298	641825	1	16	6.2	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	641957	1	15	6.6	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	641958	1	15	6.6	5.0	✓
Conductivity in Water	E100	642496	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	643704	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	642719	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	643705	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	641869	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	641921	1	20	5.0	5.0	1

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Client : Teck Coal Limited



Quality Control Sample Type			Co	ount		Frequency (%,)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	641956	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	641959	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	641960	1	19	5.2	5.0	✓
ORP by Electrode	E125	641962	1	15	6.6	5.0	✓
pH by Meter	E108	642495	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	641961	1	15	6.6	5.0	✓
TDS by Gravimetry	E162	645182	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	643302	1	16	6.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	642132	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	642722	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	643301	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	641870	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	642658	1	17	5.8	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	645179	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	641757	1	17	5.8	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	642501	1	17	5.8	5.0	✓
Alkalinity Species by Titration	E290	642497	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	641825	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	641957	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	641958	1	15	6.6	5.0	✓
Conductivity in Water	E100	642496	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	643704	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	642719	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	643705	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	641869	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	641921	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	641956	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	641959	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	641960	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	641961	1	15	6.6	5.0	✓
TDS by Gravimetry	E162	645182	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	643302	1	16	6.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	642132	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	642722	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	643301	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	641870	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	642658	1	17	5.8	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	645179	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	641757	1	17	5.8	5.0	✓

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Matrix: Water Evaluation: × = QC frequency outside specification, ✓ = QC frequency within specification.

Matrix. Water		Lvaidati	on Qo nega	chey outside spe	cincation, • - v	go nequency wit	min specification
Quality Control Sample Type			Co	ount		Frequency (%)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	641825	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	641957	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	641958	1	15	6.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	643704	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	642719	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	643705	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	641869	1	14	7.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	641921	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	641956	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	641959	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	641960	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	641961	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	643302	1	16	6.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	642132	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	642722	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	643301	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	641870	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	642658	1	17	5.8	5.0	✓

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water
	Calgary - Environmental			sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted
	Calgary - Environmental			at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results,
Trushidita ha Nasahalasa 4m.	0 7	\A/-4	ADUA 0400 D (pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
	Calgary - Environmental			scatter under defined conditions.
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the
				platinum metal-reference electrode employed, measured in mV. For high accuracy test
	Calgary - Environmental			results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
				filter, following by drying of the filter at $104 \pm 1^{\circ}$ C, with gravimetric measurement of the
	Calgary - Environmental			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre
	2102		,	filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Colorani. Faringana antal			detection.
Chlorida in Water by IC (Levy Leval)	Calgary - Environmental	Water	EDA 200.1 (mad)	
Chloride in Water by IC (Low Level)	E235.CI-L	water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
	Calgary - Environmental			detection.
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
I with a te in water by 10 (Low Level)	E235.NO3-L	vvater	Li A 300.1 (mod)	detection.
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Calgary - Environmental			
	Jaigary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
lon Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	Calgary - Environmental EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCI.



QUALITY CONTROL REPORT

Work Order : CG2212274

Client : Teck Coal Limited
Contact : Giovanna Diaz
Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ---

Project : REGIONAL EFFECT PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer I.
Site :----

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 10-Sep-2022 11:45

Date Analysis Commenced : 11-Sep-2022

Issue Date : 15-Sep-2022 16:02

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta	
Dwayne Bennett	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta	
Elke Tabora		Calgary Inorganics, Calgary, Alberta	
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta	
Harpreet Chawla	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta	
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Project : REGIONAL EFFECT PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report							
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie	
Physical Tests (QC	Lot: 641757)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	turbidity		E121	0.10	NTU	0.50	0.57	0.06	Diff <2x LOR		
Physical Tests (QC	Lot: 641962)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	oxidation-reduction potential [ORP]		E125	0.10	mV	236	236	0.212%	15%		
Physical Tests (QC	Lot: 642495)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	pH		E108	0.10	pH units	8.17	8.20	0.366%	4%		
Physical Tests (QC	Lot: 642496)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	conductivity		E100	2.0	μS/cm	1710	1710	0.468%	10%		
Physical Tests (QC	Lot: 642497)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C 2022-09 N	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	274	271	1.06%	20%		
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR		
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR		
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	274	271	1.06%	20%		
Physical Tests (QC	Lot: 642501)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR		
Physical Tests (QC	Lot: 645182)											
CG2212233-003	Anonymous	solids, total dissolved [TDS]		E162	20	mg/L	837	852	1.72%	20%		
Anions and Nutrien	ts (QC Lot: 641825)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR		
Anions and Nutrien	ts (QC Lot: 641921)											
CG2212270-021	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR		
Anions and Nutrien	ts (QC Lot: 641956)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	fluoride	16984-48-8	E235.F	0.100	mg/L	0.195	0.190	0.005	Diff <2x LOR		
Anions and Nutrien	ts (QC Lot: 641957)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR		
Anions and Nutrien	ts (QC Lot: 641958)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	chloride	16887-00-6	E235.CI-L	0.50	mg/L	2.24	2.22	0.01	Diff <2x LOR		
Anions and Nutrien	ts (QC Lot: 641959)											

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Sub-Matrix: Water						Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier	
Anions and Nutrie	ents (QC Lot: 641959) - co	ontinued										
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	6.17	6.14	0.419%	20%		
Anions and Nutrie	ents (QC Lot: 641960)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR		
Anions and Nutrie	ents (QC Lot: 641961)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	932	923	0.990%	20%		
Anions and Nutrie	ents (QC Lot: 642132)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.393	0.392	0.0005	Diff <2x LOR		
Anions and Nutrie	ents (QC Lot: 642658)											
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0052	0.0031	0.0020	Diff <2x LOR		
Organic / Inorgani	c Carbon (QC Lot: 64186	9)										
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.33	1.37	0.04	Diff <2x LOR		
Organic / Inorgani	c Carbon (QC Lot: 64187	0)										
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	carbon, total organic [TOC]		E355-L	0.50	mg/L	1.39	1.28	0.11	Diff <2x LOR		
Total Metals (QC	Lot: 642722)											
CG2212136-001	Anonymous	mercury, total	7439-97-6	E508	0.0000500	mg/L	<0.0000500	<0.0000500	0	Diff <2x LOR		
Total Metals (QC	Lot: 643301)											
CG2212204-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0203	0.0186	0.0017	Diff <2x LOR		
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00017	0.00017	0.000001	Diff <2x LOR		
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00048	0.00046	0.00001	Diff <2x LOR		
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0164	0.0163	0.465%	20%		
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR		
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR		
		boron, total	7440-42-8	E420	0.010	mg/L	0.032	0.031	0.001	Diff <2x LOR		
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0142 µg/L	0.0000107	0.0000035	Diff <2x LOR		
		calcium, total	7440-70-2	E420	0.050	mg/L	236	228	3.49%	20%		
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.39 µg/L	0.00039	0.000004	Diff <2x LOR		
		copper, total	7440-50-8	E420	0.00010	mg/L	<0.00050	<0.00050	0.000004	Diff <2x LOR		
		iron, total	7439-89-6	E420	0.00030	mg/L	0.169	0.170	0.725%	20%		
		·	7439-09-0	E420	0.000050	-	<0.000050	<0.000050	0.72570	Diff <2x LOR		
		lead, total	7439-92-1	E420	0.00050	mg/L	0.163	0.154	5.65%	20%		
		lithium, total				mg/L						
		magnesium, total	7439-95-4	E420	0.0050	mg/L	151	153	1.04%	20%		
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0284	0.0288	1.56%	20%		

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Client : Teck Coal Limited



ub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Total Metals (QC Lo	t: 643301) - continued										
CG2212204-001	Anonymous	molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00190	0.00187	1.74%	20%	
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00509	0.00520	2.10%	20%	
		potassium, total	7440-09-7	E420	0.050	mg/L	4.58	4.63	1.15%	20%	
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.808 µg/L	0.000831	2.79%	20%	
		silicon, total	7440-21-3	E420	0.10	mg/L	3.22	3.23	0.333%	20%	
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		sodium, total	7440-23-5	E420	0.050	mg/L	10.5	10.6	1.54%	20%	
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.542	0.539	0.538%	20%	
		sulfur, total	7704-34-9	E420	0.50	mg/L	266	268	0.696%	20%	
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000020	0.000018	0.000001	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00017	0.00016	0.00002	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00771	0.00771	0.0799%	20%	
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	
otal Metals (QC Lo	t: 643302)										
CG2212204-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
Dissolved Metals (Q	C Lot: 642719)										
CG2212274-001	RG_GHFF_WS_LAEMP_G C 2022-09 N	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (Q	C Lot: 643704)										
CG2212019-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00017	0.00016	0.000004	Diff <2x LOR	
issolved Metals (Q	C Lot: 643705)										
CG2212019-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0019	0.0011	0.0008	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00015	0.00015	0.000002	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00024	0.00024	0.000002	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0844	0.0843	0.120%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.028	0.030	0.001	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0223 μg/L	0.0000188	0.0000035	Diff <2x LOR	
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	96.6	96.1	0.432%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.12 μg/L	0.00011	0.000004	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead. dissolved	7439-92-1	E421	0.000050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		leau, uissulveu	1400-02-1	L72 I	0.000000	mg/L	-0.000000	*0.000000		DIII >ZX LOR	

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Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
issolved Metals (QC Lot: 643705) - co	ntinued									
CG2212019-001	Anonymous	lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0145	0.0145	0.159%	20%	
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	37.8	37.1	1.82%	20%	
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00217	0.00221	1.79%	20%	
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00106	0.00108	1.72%	20%	
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00513	0.00512	0.225%	20%	
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.17	1.15	1.90%	20%	
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	4.74 μg/L	0.00472	0.351%	20%	
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.07	2.05	1.03%	20%	
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	10.2	10.1	1.39%	20%	
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.347	0.341	1.84%	20%	
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	83.8	81.5	2.76%	20%	
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000020	0.000018	0.000002	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00180	0.00184	2.32%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0010	0.0011	0.00009	Diff <2x LOR	
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Method Blank (MB) Report

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

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 641757)					
urbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 642496)					
onductivity	E100	1	μS/cm	<1.0	
Physical Tests (QCLot: 642497)					
lkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
Ikalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
ılkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
ılkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 642501)					
cidity (as CaCO3)	E283	2	mg/L	2.1	
Physical Tests (QCLot: 645179)					
olids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 645182)					
olids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 641825)					
mmonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 641921)					
hosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 641956)					
uoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 641957)					
romide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 641958)					
hloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 641959)					
itrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 641960)					
itrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 641961)					
ulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 642132)					
(jeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 642658						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	
Organic / Inorganic Carbon (QCLot: 6	341869)					
arbon, dissolved organic [DOC]		E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot: 6						
carbon, total organic [TOC]		E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 642722)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.000050	
Total Metals (QCLot: 643301)						
aluminum, total	7429-90-5 I		0.003	mg/L	<0.0030	
antimony, total	7440-36-0		0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2		0.0001	mg/L	<0.00010	
parium, total	7440-39-3		0.0001	mg/L	<0.00010	
peryllium, total	7440-41-7		0.00002	mg/L	<0.000020	
pismuth, total	7440-69-9		0.00005	mg/L	<0.000050	
poron, total	7440-42-8	E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	
ron, total	7439-89-6	E420	0.01	mg/L	<0.010	
ead, total	7439-92-1 I	E420	0.00005	mg/L	<0.000050	
ithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	
nagnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	
nanganese, total	7439-96-5 I	E420	0.0001	mg/L	<0.00010	
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 643301) - contin	ued				
uranium, total	7440-61-1 E420	0.00001	mg/L	<0.000010	
vanadium, total	7440-62-2 E420	0.0005	mg/L	<0.00050	
zinc, total	7440-66-6 E420	0.003	mg/L	<0.0030	
Fotal Metals (QCLot: 643302)					
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 642719)					
nercury, dissolved	7439-97-6 E509	0.000005	mg/L	<0.0000050	
Dissolved Metals (QCLot: 643704)					
hromium, dissolved	7440-47-3 E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 643705)					
luminum, dissolved	7429-90-5 E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	<0.00010	
rsenic, dissolved	7440-38-2 E421	0.0001	mg/L	<0.00010	
arium, dissolved	7440-39-3 E421	0.0001	mg/L	<0.00010	
eryllium, dissolved	7440-41-7 E421	0.00002	mg/L	<0.000020	
ismuth, dissolved	7440-69-9 E421	0.00005	mg/L	<0.000050	
oron, dissolved	7440-42-8 E421	0.01	mg/L	<0.010	
admium, dissolved	7440-43-9 E421	0.000005	mg/L	<0.000050	
alcium, dissolved	7440-70-2 E421	0.05	mg/L	<0.050	
obalt, dissolved	7440-48-4 E421	0.0001	mg/L	<0.00010	
opper, dissolved	7440-50-8 E421	0.0002	mg/L	<0.00020	
ron, dissolved	7439-89-6 E421	0.01	mg/L	<0.010	
ead, dissolved	7439-92-1 E421	0.00005	mg/L	<0.000050	
thium, dissolved	7439-93-2 E421	0.001	mg/L	<0.0010	
nagnesium, dissolved	7439-95-4 E421	0.005	mg/L	<0.0050	
nanganese, dissolved	7439-96-5 E421	0.0001	mg/L	<0.00010	
nolybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	<0.000050	
ickel, dissolved	7440-02-0 E421	0.0005	mg/L	<0.00050	
otassium, dissolved	7440-09-7 E421	0.05	mg/L	<0.050	
elenium, dissolved	7782-49-2 E421	0.00005	mg/L	<0.000050	
ilicon, dissolved	7440-21-3 E421	0.05	mg/L	<0.050	
ilver, dissolved	7440-22-4 E421	0.00001	mg/L	<0.000010	
odium, dissolved	7440-23-5 E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9 E421	0.5	mg/L	<0.50	
thallium, dissolved	7440-28-0 E421	0.00001	mg/L	<0.000010	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 643705) -	continued					
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water	Laboratory Control Sample (LCS) Report							
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte CAS Nu	mber Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 641757)								
turbidity	E121	0.1	NTU	200 NTU	101	85.0	115	
Physical Tests (QCLot: 641962)								
oxidation-reduction potential [ORP]	E125		mV	220 mV	101	95.4	104	
Physical Tests (QCLot: 642495)								
pH	E108		pH units	7 pH units	101	98.6	101	
Physical Tests (QCLot: 642496)								
conductivity	E100	1	μS/cm	146.9 μS/cm	97.8	90.0	110	
Physical Tests (QCLot: 642497)								
alkalinity, total (as CaCO3)	E290	1	mg/L	500 mg/L	104	85.0	115	
Physical Tests (QCLot: 642501)								
acidity (as CaCO3)	E283	2	mg/L	50 mg/L	109	85.0	115	
Physical Tests (QCLot: 645179)								
solids, total suspended [TSS]	E160-L	1	mg/L	150 mg/L	102	85.0	115	
Physical Tests (QCLot: 645182)								
solids, total dissolved [TDS]	E162	10	mg/L	1000 mg/L	95.4	85.0	115	
Anions and Nutrients (QCLot: 641825)								
	41-7 E298	0.005	mg/L	0.2 mg/L	97.9	85.0	115	
Anions and Nutrients (QCLot: 641921)								
	44-2 E378-U	0.001	mg/L	0.03 mg/L	98.3	80.0	120	
Anions and Nutrients (QCLot: 641956)								
	48-8 E235.F	0.02	mg/L	1 mg/L	103	90.0	110	
Anions and Nutrients (QCLot: 641957)								
	67-9 E235.Br-L	0.05	mg/L	0.5 mg/L	103	85.0	115	
Anions and Nutrients (QCLot: 641958)								
	00-6 E235.CI-L	0.1	mg/L	100 mg/L	100	90.0	110	
Anions and Nutrients (QCLot: 641959)								1
	55-8 E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 641960)								
	65-0 E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	
Anions and Nutrients (QCLot: 641961)								I
	79-8 E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	
Anions and Nutrients (QCLot: 642132)								
Amons and Nathents (QOLOL 042132)								

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nione and Nutrients (OCLot: 642132) - continued deals richargen, for (PAS)	Sub-Matrix: Water				Laboratory Control Sample (LCS) Report						
Seal Multiputs (OCLot: 642132) - continued Seal					Spike	Recovery (%)	Recovery	Limits (%)			
Part	Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Page	Anions and Nutrients (QCLot: 642132)	- continued									
Page	Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	4 mg/L	100	75.0	125			
Page	Anions and Nutrients (QCLot: 642658)										
## 1898-L 0.5 mg/L 8.57 mg/L 99.7 90.0 120	phosphorus, total	7723-14-0 E372-U	0.002	mg/L	0.03 mg/L	99.4	80.0	120			
## 1898-L 0.5 mg/L 8.57 mg/L 99.7 90.0 120											
## 1898-L 0.5 mg/L 8.57 mg/L 99.7 90.0 120	Organic / Inorganic Carbon (QCLot: 64										
Actal Metals (QCLot: 642722) Series (Processed of the Color of the Co	carbon, dissolved organic [DOC]		0.5	mg/L	8.57 mg/L	99.7	80.0	120			
Actal Metals (QCLot: 642722) Series (Processed of the Color of the Co	Organic / Inorganic Carbon (QCLot: 64	11870)									
	carbon, total organic [TOC]		0.5	mg/L	8.57 mg/L	97.1	80.0	120			
	Total Metals (QCLot: 642722)										
uminum, total 7429-90-5 [420 0.003 mg/L 1 mg/L 105 80.0 120	mercury, total	7439-97-6 E508	0.000005	mg/L	0.0001 mg/L	104	80.0	120			
uminum, total 7429-90-5 [420 0.003 mg/L 1 mg/L 105 80.0 120	Total Metals (QCLot: 643301)										
senic, total 7440-38-2 E420 0.0001 mg/L 1 mg/L 97.6 80.0 120	aluminum, total	7429-90-5 E420	0.003	mg/L	2 mg/L	95.1	80.0	120			
rirum, total 7440-93-3	antimony, total	7440-36-0 E420	0.0001	mg/L	1 mg/L	105	80.0	120			
reflium, total 7440-41-7 E420 0.00002 mg/L 0.1 mg/L 96.1 80.0 120	arsenic, total	7440-38-2 E420	0.0001	mg/L	1 mg/L	97.6	80.0	120			
smuth, total 7440-69-9 E420 0.00005 mg/L 1 mg/L 101 80.0 120 yoron, total 7440-48-8 E420 0.01 mg/L 1 mg/L 92.7 80.0 120 yoron, total 7440-48-9 E420 0.00005 mg/L 0.1 mg/L 96.1 80.0 120 yoron, total 7440-80-9 E420 0.00005 mg/L 0.1 mg/L 96.1 80.0 120 yoron, total 7440-80-1 E420 0.0001 mg/L 0.25 mg/L 96.0 80.0 120 yoron, total 7440-80-1 E420 0.0001 mg/L 0.25 mg/L 96.2 80.0 120 yoron, total 7440-80-1 E420 0.0005 mg/L 0.25 mg/L 96.2 80.0 120 yoron, total 749-80-6 E420 0.0005 mg/L 0.55 mg/L 96.2 80.0 120 yoron, total 749-80-6 E420 0.0005 mg/L 0.55 mg/L 99.7 80.0 120 yoron, total 749-80-6 E420 0.0001 mg/L 0.55 mg/L 99.7 80.0 120 yoron, total 749-80-6 E420 0.0001 mg/L 0.25 mg/L 99.7 80.0 120 yoron, total 749-90-5 E420 0.0001 mg/L 0.25 mg/L 99.7 80.0 120 yoron, total 749-90-5 E420 0.0001 mg/L 0.25 mg/L 99.2 80.0 120 yoron, total 749-90-5 E420 0.0001 mg/L 0.25 mg/L 99.2 80.0 120 yoron, total 749-90-5 E420 0.0005 mg/L 0.25 mg/L 99.2 80.0 120 yoron, total 749-90-5 E420 0.0005 mg/L 0.55 mg/L 99.2 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.55 mg/L 99.2 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.55 mg/L 99.2 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.55 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.55 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.0005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, total 749-00-7 E420 0.00005 mg/L 0.0005 mg/L 99.5 80.0 120 yoron, tot	barium, total	7440-39-3 E420	0.0001	mg/L	0.25 mg/L	99.8	80.0	120			
ron, total 7440-42-8 E420 0.01 mg/L 1 mg/L 92.7 80.0 120	beryllium, total	7440-41-7 E420	0.00002	mg/L	0.1 mg/L	96.1	80.0	120			
Admium, total 7440-43-9 E420 0.000005 mg/L 0.1 mg/L 96.1 80.0 120	bismuth, total	7440-69-9 E420	0.00005	mg/L	1 mg/L	101	80.0	120			
alcium, total 7440-70-2 E420 0.05 mg/L 50 mg/L 96.0 80.0 120	boron, total	7440-42-8 E420	0.01	mg/L	1 mg/L	92.7	80.0	120			
abalt, total 7440-48-4 420 0.0001 mg/L 0.25 mg/L 95.3 80.0 120	cadmium, total	7440-43-9 E420	0.000005	mg/L	0.1 mg/L	96.1	80.0	120			
poper, total 7440-50-8 poper, total 7440-50-8 poper, total 7439-89-6 poper, total 7439-89-7 poper, total 7439-89-6 poper, total 7439-89-7 poper, total 7439-89-8	calcium, total	7440-70-2 E420	0.05	mg/L	50 mg/L	96.0	80.0	120			
no, total 7439-89-6 E420 0.01 mg/L 1 mg/L 105 80.0 120	cobalt, total	7440-48-4 E420	0.0001	mg/L	0.25 mg/L	95.3	80.0	120			
Ad, total 7439-92-1 E420 0.0005 mg/L 0.5 mg/L 99.7 80.0 120	copper, total	7440-50-8 E420	0.0005	mg/L	0.25 mg/L	96.2	80.0	120			
hium, total 7439-93-2	iron, total	7439-89-6 E420	0.01	mg/L	1 mg/L	105	80.0	120			
agnesium, total 7439-95-4 E420 0.005 mg/L 50 mg/L 95.6 80.0 120 anganese, total 7439-96-5 E420 0.0001 mg/L 0.25 mg/L 99.2 80.0 120 collybdenum, total 7439-98-7 E420 0.0005 mg/L 0.25 mg/L 102 80.0 120 collection, total 7440-02-0 E420 0.0005 mg/L 0.5 mg/L 96.0 80.0 120 collection, total 7440-24-6 E420 0.0005 mg/L 10 mg/L 97.1 80.0 120 contium, total 7440-24-6 E420 0.0005 mg/L 10 mg/L 10 mg/L 92.5 80.0 120 contium, total 7440-23-5 E420 0.0001 mg/L 10 mg/L 10 mg/L 10 mg/L 10 mg/L 10 mg/L 10 mg/L 91.0 80.0 120 contium, total 7440-23-6 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 contium, total 7440-23-6 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 contium, total 7440-23-6 E420 0.0002 mg/L 50 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L	lead, total	7439-92-1 E420	0.00005	mg/L	0.5 mg/L	99.7	80.0	120			
anganese, total 7439-96-5 E420 0.0001 mg/L 0.25 mg/L 99.2 80.0 120 olybdenum, total 7439-98-7 E420 0.0005 mg/L 0.25 mg/L 102 80.0 120 ckel, total 7440-02-0 E420 0.0005 mg/L 0.5 mg/L 96.0 80.0 120 otassium, total 7440-09-7 E420 0.05 mg/L 50 mg/L 97.1 80.0 120 elenium, total 7782-49-2 E420 0.0005 mg/L 1 mg/L 92.5 80.0 120 clicon, total 7440-21-3 E420 0.1 mg/L 10 mg/L 100 60.0 140 otver, total 7440-22-4 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 clicon, total 7440-22-4 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 clicon, total 7440-22-4 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 clicon, total 7440-23-5 E420 0.05 mg/L 50 mg/L 96.7 80.0 120 contium, total 7440-23-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 contium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	lithium, total	7439-93-2 E420	0.001	mg/L	0.25 mg/L	93.8	80.0	120			
olybdenum, total 7439-98-7 E420 0.0005 mg/L 0.25 mg/L 102 80.0 120 obele, total 7440-02-0 E420 0.0005 mg/L 0.5 mg/L 96.0 80.0 120 obelenium, total 7440-09-7 E420 0.005 mg/L 50 mg/L 97.1 80.0 120 obelenium, total 7440-21-3 E420 0.0005 mg/L 1 mg/L 92.5 80.0 120 obelenium, total 7440-21-3 E420 0.1 mg/L 10 mg/L 10 mg/L 100 60.0 140 obelenium, total 7440-22-4 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 obelenium, total 7440-23-5 E420 0.0001 mg/L 0.1 mg/L 91.0 80.0 120 obelenium, total 7440-23-5 E420 0.0001 mg/L 50 mg/L 96.7 80.0 120 obelenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 obelenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 obelenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 obelenium, total	magnesium, total	7439-95-4 E420	0.005	mg/L	50 mg/L	95.6	80.0	120			
ckel, total 7440-02-0 bdassium, total E420 0.0005 mg/L mg/L 0.5 mg/L 96.0 80.0 120	manganese, total	7439-96-5 E420	0.0001	mg/L	0.25 mg/L	99.2	80.0	120			
tassium, total 7440-09-7 E420 0.05 mg/L 50 mg/L 97.1 80.0 120 elenium, total 7782-49-2 E420 0.00005 mg/L 1 mg/L 92.5 80.0 120 elenium, total 7440-21-3 E420 0.1 mg/L 10 mg/L 100 60.0 140 ever, total 7440-22-4 E420 0.00001 mg/L 0.1 mg/L 91.0 80.0 120 elenium, total 7440-23-5 E420 0.000 mg/L 50 mg/L 96.7 80.0 120 elenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 elenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 elenium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 elenium, total 97.1 80.0 120 ele	molybdenum, total	7439-98-7 E420	0.00005	mg/L	0.25 mg/L	102	80.0	120			
selenium, total 7782-49-2 E420 0.0005 mg/L 1 mg/L 92.5 80.0 120 iicon, total 7440-21-3 E420 0.1 mg/L 10 mg/L 100 60.0 140 iver, total 7440-22-4 E420 0.00001 mg/L 0.1 mg/L 91.0 80.0 120 odium, total 7440-23-5 E420 0.05 mg/L 50 mg/L 96.7 80.0 120 rontium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	nickel, total	7440-02-0 E420	0.0005	mg/L	0.5 mg/L	96.0	80.0	120			
Plenium, total 7782-49-2 E420 0.00005 mg/L 1 mg/L 92.5 80.0 120 ficon, total 7440-21-3 E420 0.1 mg/L 10 mg/L 100 60.0 140 fortium, total 7440-23-5 E420 0.00001 mg/L 0.1 mg/L 91.0 80.0 120 fortium, total 7440-23-5 E420 0.0002 mg/L 0.25 mg/L 0.25 mg/L 103 80.0 120 fortium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120 fortium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	potassium, total	7440-09-7 E420	0.05	mg/L	50 mg/L	97.1	80.0	120			
icon, total 7440-21-3 E420 0.1 mg/L 10 mg/L 100 60.0 140 ver, total 7440-22-4 E420 0.00001 mg/L 0.1 mg/L 91.0 80.0 120 volum, total 7440-23-5 E420 0.05 mg/L 50 mg/L 96.7 80.0 120 vontium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	selenium, total	7782-49-2 E420	0.00005	mg/L	_	92.5	80.0	120			
ver, total 7440-22-4 E420 0.00001 mg/L 0.1 mg/L 91.0 80.0 120 addum, total 7440-23-5 E420 0.000 mg/L 50 mg/L 96.7 80.0 120 rontium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	silicon, total	7440-21-3 E420	0.1	mg/L	_	100	60.0	140			
odium, total 7440-23-5 E420 0.05 mg/L 50 mg/L 96.7 80.0 120 rontium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	silver, total	7440-22-4 E420	0.00001		_		80.0	120			
rontium, total 7440-24-6 E420 0.0002 mg/L 0.25 mg/L 103 80.0 120	sodium, total	7440-23-5 E420	0.05	mg/L	_		80.0	120			
	strontium, total	7440-24-6 E420	0.0002		_		80.0	120			
	sulfur, total	7704-34-9 E420	0.5	mg/L	50 mg/L	102	80.0	120			

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited



Sub-Matrix: Water	Laboratory Control Sample (LCS) Report							
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 643301) - continued								
thallium, total	7440-28-0 E420	0.00001	mg/L	1 mg/L	101	80.0	120	
tin, total	7440-31-5 E420	0.0001	mg/L	0.5 mg/L	99.0	80.0	120	
titanium, total	7440-32-6 E420	0.0003	mg/L	0.25 mg/L	93.0	80.0	120	
uranium, total	7440-61-1 E420	0.00001	mg/L	0.005 mg/L	91.7	80.0	120	
vanadium, total	7440-62-2 E420	0.0005	mg/L	0.5 mg/L	96.9	80.0	120	
zinc, total	7440-66-6 E420	0.003	mg/L	0.5 mg/L	93.8	80.0	120	
Total Metals (QCLot: 643302)								
chromium, total	7440-47-3 E420.Cr	·L 0.0001	mg/L	0.25 mg/L	96.8	80.0	120	
mercury, dissolved	7439-97-6 E509	0.000005	mg/L	0.0001 mg/L	103	80.0	120	
Dissolved Metals (QCLot: 643704)								
chromium, dissolved	7440-47-3 E421.Cr	-L 0.0001	mg/L	0.25 mg/L	103	80.0	120	
Dissolved Metals (QCLot: 643705)								
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	2 mg/L	110	80.0	120	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	1 mg/L	101	80.0	120	
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	1 mg/L	98.2	80.0	120	
barium, dissolved	7440-39-3 E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	
beryllium, dissolved	7440-41-7 E421	0.00002	mg/L	0.1 mg/L	104	80.0	120	
bismuth, dissolved	7440-69-9 E421	0.00005	mg/L	1 mg/L	101	80.0	120	
boron, dissolved	7440-42-8 E421	0.01	mg/L	1 mg/L	105	80.0	120	
cadmium, dissolved	7440-43-9 E421	0.000005	mg/L	0.1 mg/L	102	80.0	120	
calcium, dissolved	7440-70-2 E421	0.05	mg/L	50 mg/L	102	80.0	120	
cobalt, dissolved	7440-48-4 E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	
copper, dissolved	7440-50-8 E421	0.0002	mg/L	0.25 mg/L	97.7	80.0	120	
iron, dissolved	7439-89-6 E421	0.01	mg/L	1 mg/L	111	80.0	120	
lead, dissolved	7439-92-1 E421	0.00005	mg/L	0.5 mg/L	104	80.0	120	
lithium, dissolved	7439-93-2 E421	0.001	mg/L	0.25 mg/L	102	80.0	120	
magnesium, dissolved	7439-95-4 E421	0.005	mg/L	50 mg/L	104	80.0	120	
manganese, dissolved	7439-96-5 E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	
molybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	0.25 mg/L	104	80.0	120	
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	0.5 mg/L	99.4	80.0	120	
potassium, dissolved	7440-09-7 E421	0.05	mg/L	50 mg/L	106	80.0	120	
selenium, dissolved	7782-49-2 E421	0.00005	mg/L	1 mg/L	96.9	80.0	120	
silicon, dissolved	7440-21-3 E421	0.05	mg/L	10 mg/L	106	60.0	140	
silver, dissolved	7440-22-4 E421	0.00001	mg/L	0.1 mg/L	91.1	80.0	120	
sodium, dissolved	7440-23-5 E421	0.05	mg/L	50 mg/L	104	80.0	120	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited



Sub-Matrix: Water	p-Matrix: Water					Laboratory Control Sample (LCS) Report					
						Recovery (%)	Recovery Limits (%)				
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Dissolved Metals (QCLot: 643705) - co	ontinued										
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.8	80.0	120			
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	100	80.0	120			
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.0	80.0	120			
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.1	80.0	120			
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.0	80.0	120			
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120			
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.8	80.0	120			

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Matrix Spike (MS) Report

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

Sub-Matrix: Water				Matrix Spike (MS) Report						
					Spi	ike	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	ents (QCLot: 641825)									
CG2212276-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.101 mg/L	0.1 mg/L	101	75.0	125	
Anions and Nutri	ents (QCLot: 641921)									
CG2212273-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0538 mg/L	0.05 mg/L	108	70.0	130	
Anions and Nutri	ents (QCLot: 641956)									
CG2212276-001	Anonymous	fluoride	16984-48-8	E235.F	0.982 mg/L	1 mg/L	98.2	75.0	125	
Anions and Nutri	ents (QCLot: 641957)									
CG2212276-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.514 mg/L	0.5 mg/L	103	75.0	125	
Anions and Nutri	ents (QCLot: 641958)									
CG2212276-001	Anonymous	chloride	16887-00-6	E235.CI-L	100 mg/L	100 mg/L	100	75.0	125	
Anions and Nutri	ents (QCLot: 641959)									
CG2212276-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	
Anions and Nutri	ents (QCLot: 641960)									
CG2212276-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.509 mg/L	0.5 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 641961)									
CG2212276-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	
Anions and Nutri	ents (QCLot: 642132)									
CG2212276-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.80 mg/L	2.5 mg/L	112	70.0	130	
Anions and Nutri	ents (QCLot: 642658)									
CG2212276-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0528 mg/L	0.05 mg/L	106	70.0	130	
Organic / Inorgar	nic Carbon (QCLot: 641	869)								
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	carbon, dissolved organic [DOC]		E358-L	5.37 mg/L	5 mg/L	107	70.0	130	
Organic / Inorgar	nic Carbon (QCLot: 641	870)								
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	carbon, total organic [TOC]		E355-L	5.54 mg/L	5 mg/L	111	70.0	130	
otal Metals (QC	Lot: 642722)									
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	mercury, total	7439-97-6	E508	0.0000951 mg/L	0.0001 mg/L	95.1	70.0	130	
otal Metals (QC	Lot: 643301)									
CG2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	aluminum, total	7429-90-5	E420	2.06 mg/L	2 mg/L	103	70.0	130	

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited



ub-Matrix: Water							Matrix Spike (MS) Report Recovery (%) Recovery Limits (%)				
					Spi	ke	Recovery (%)	Recovery	Limits (%)		
boratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie	
tal Metals (QC	CLot: 643301) - continue	d									
G2212274-001	RG_GHFF_WS_LAEMP_G	antimony, total	7440-36-0	E420	0.208 mg/L	0.2 mg/L	104	70.0	130		
	C_2022-09_N	arsenic, total	7440-38-2	E420	0.211 mg/L	0.2 mg/L	106	70.0	130		
		barium, total	7440-39-3	E420	0.220 mg/L	0.2 mg/L	110	70.0	130		
		beryllium, total	7440-41-7	E420	0.391 mg/L	0.4 mg/L	97.8	70.0	130		
		bismuth, total	7440-69-9	E420	0.0988 mg/L	0.1 mg/L	98.8	70.0	130		
		boron, total	7440-42-8	E420	0.936 mg/L	1 mg/L	93.6	70.0	130		
		cadmium, total	7440-43-9	E420	0.0441 mg/L	0.04 mg/L	110	70.0	130		
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130		
		cobalt, total	7440-48-4	E420	0.213 mg/L	0.2 mg/L	106	70.0	130		
		copper, total	7440-50-8	E420	0.216 mg/L	0.2 mg/L	108	70.0	130		
		iron, total	7439-89-6	E420	21.6 mg/L	20 mg/L	108	70.0	130		
		lead, total	7439-92-1	E420	0.197 mg/L	0.2 mg/L	98.7	70.0	130		
		lithium, total	7439-93-2	E420	0.981 mg/L	1 mg/L	98.1	70.0	130		
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130		
		manganese, total	7439-96-5	E420	0.216 mg/L	0.2 mg/L	108	70.0	130		
		molybdenum, total	7439-98-7	E420	0.213 mg/L	0.2 mg/L	106	70.0	130		
		nickel, total	7440-02-0	E420	0.429 mg/L	0.4 mg/L	107	70.0	130		
		potassium, total	7440-09-7	E420	41.6 mg/L	40 mg/L	104	70.0	130		
		selenium, total	7782-49-2	E420	0.420 mg/L	0.4 mg/L	105	70.0	130		
		silicon, total	7440-21-3	E420	92.2 mg/L	100 mg/L	92.2	70.0	130		
		silver, total	7440-22-4	E420	0.0428 mg/L	0.04 mg/L	107	70.0	130		
		sodium, total	7440-23-5	E420	22.3 mg/L	20 mg/L	112	70.0	130		
		strontium, total	7440-24-6	E420	ND mg/L	0.2 mg/L	ND	70.0	130		
		sulfur, total	7704-34-9	E420	ND mg/L	200 mg/L	ND	70.0	130		
		thallium, total	7440-28-0	E420	0.0390 mg/L	0.04 mg/L	97.6	70.0	130		
		tin, total	7440-31-5	E420	0.213 mg/L	0.2 mg/L	106	70.0	130		
		titanium, total	7440-32-6	E420	0.408 mg/L	0.4 mg/L	102	70.0	130		
		uranium, total	7440-61-1	E420	0.0396 mg/L	0.04 mg/L	99.1	70.0	130		
		vanadium, total	7440-62-2	E420	1.07 mg/L	1 mg/L	107	70.0	130		
		zinc, total	7440-66-6	E420	4.14 mg/L	4 mg/L	104	70.0	130		
tal Metals (QC	CLot: 643302)										
G2212274-001	RG_GHFF_WS_LAEMP_G C_2022-09_N	chromium, total	7440-47-3	E420.Cr-L	0.435 mg/L	0.4 mg/L	109	70.0	130		
ssolved Metals	(QCLot: 642719)										
G2212276-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.000102 mg/L	0.0001 mg/L	102	70.0	130		

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited



Sub-Matrix: Water						Matrix Spik	re (MS) Report			
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals	(QCLot: 643704) -	continued								
CG2212204-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.372 mg/L	0.4 mg/L	93.1	70.0	130	
Dissolved Metals	(QCLot: 643705)									
CG2212204-001	Anonymous	aluminum, dissolved	7429-90-5	E421	1.89 mg/L	2 mg/L	94.7	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.184 mg/L	0.2 mg/L	92.2	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.182 mg/L	0.2 mg/L	91.1	70.0	130	
		barium, dissolved	7440-39-3	E421	0.186 mg/L	0.2 mg/L	93.3	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.364 mg/L	0.4 mg/L	91.0	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.0891 mg/L	0.1 mg/L	89.1	70.0	130	
		boron, dissolved	7440-42-8	E421	0.969 mg/L	1 mg/L	96.9	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.0392 mg/L	0.04 mg/L	97.9	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.185 mg/L	0.2 mg/L	92.6	70.0	130	
		copper, dissolved	7440-50-8	E421	0.181 mg/L	0.2 mg/L	90.6	70.0	130	
		iron, dissolved	7439-89-6	E421	18.2 mg/L	20 mg/L	91.2	70.0	130	
		lead, dissolved	7439-92-1	E421	0.192 mg/L	0.2 mg/L	96.1	70.0	130	
		lithium, dissolved	7439-93-2	E421	0.943 mg/L	1 mg/L	94.3	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.186 mg/L	0.2 mg/L	93.0	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.191 mg/L	0.2 mg/L	95.7	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.366 mg/L	0.4 mg/L	91.5	70.0	130	
		potassium, dissolved	7440-09-7	E421	34.7 mg/L	40 mg/L	86.8	70.0	130	
		selenium, dissolved	7782-49-2	E421	0.377 mg/L	0.4 mg/L	94.3	70.0	130	
		silicon, dissolved	7440-21-3	E421	91.7 mg/L	100 mg/L	91.7	70.0	130	
		silver, dissolved	7440-22-4	E421	0.0376 mg/L	0.04 mg/L	94.0	70.0	130	
		sodium, dissolved	7440-23-5	E421	18.6 mg/L	20 mg/L	93.1	70.0	130	
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.0344 mg/L	0.04 mg/L	86.1	70.0	130	
		tin, dissolved	7440-31-5	E421	0.184 mg/L	0.2 mg/L	92.3	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.357 mg/L	0.4 mg/L	89.2	70.0	130	
		uranium, dissolved	7440-61-1	E421	0.0368 mg/L	0.04 mg/L	91.9	70.0	130	
		vanadium, dissolved	7440-62-2	E421	0.937 mg/L	1 mg/L	93.7	70.0	130	
		zinc, dissolved	7440-66-6	E421	3.66 mg/L	4 mg/L	91.5	70.0	130	

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 Work Order
 : CG2212274

 Client
 : Teck Coal Limited



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CERTIFICATE OF ANALYSIS

Work Order : CG2212409

Client : Teck Coal Limited

Contact : Giovanna Diaz

Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : --

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 13-Sep-2022 09:11

Date Analysis Commenced : 13-Sep-2022

Issue Date : 15-Sep-2022 15:27

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Elke Tabora		Inorganics, Calgary, Alberta
Kevin Baxter		Metals, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sara Niroomand		Metals, Calgary, Alberta
Sonthuong Bui	Laboratory Analyst	Metals, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

Page : 2 of 6 Work Order : CG2212409 Client

: Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Qualifiers

Description
Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
Conductivity.
Analytical holding time was exceeded.
TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

>: greater than.

Page : 3 of 6
Work Order : CG2212409
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			C	lient sample ID	RG_GHNF_WS_		 	
(Matrix: Water)					LAEMP_GC_20 22-09_N			
			Client samp	oling date / time	09-Sep-2022 13:05		 	
Analyte	CAS Number	Method	LOR	Unit	CG2212409-001		 	
					Result		 	
Physical Tests								
acidity (as CaCO3)		E283	2.0	mg/L	4.8		 	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	400		 	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	489		 	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0		 	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0		 	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0		 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0		 	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	400		 	
conductivity		E100	2.0	μS/cm	2080		 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	1450		 	
oxidation-reduction potential [ORP]		E125	0.10	mV	338		 	
рН		E108	0.10	pH units	8.17		 	
solids, total dissolved [TDS]		E162	10	mg/L	1910		 	
solids, total suspended [TSS]	<u></u>	E160-L	1.0	mg/L	14.6		 	
turbidity		E121	0.10	NTU	1.31 HTA		 	
Anions and Nutrients								
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050		 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS		 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	3.15		 	
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 DLDS		 	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.519 TKNI		 	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	8.55		 	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS		 	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010 HTA		 	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0292		 	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	1100		 	
Organic / Inorganic Carbon	1 1000-10-0							
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.47		 	
carbon, total organic [TOC]		E355-L	0.50	mg/L	2.35		 	
		_000 L	5.55	g, L	2.00			I

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Work Order : CG2212409
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_GHNF_WS_ LAEMP_GC_20 22-09_N	 		
			Client samp	ling date / time	09-Sep-2022 13:05	 		
Analyte	CAS Number	Method	LOR	Unit	CG2212409-001	 		
Ion Balance					Result	 		
anion sum		EC101	0.10	meq/L	31.6	 		
cation sum		EC101	0.10	meg/L	29.1	 		
ion balance (cations/anions)		EC101	0.010	%	92.1	 		
ion balance (APHA)		EC101	0.010	%	4.12	 		
Total Metals							I.	
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0499	 		
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00060	 		
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00024	 		
barium, total	7440-39-3	E420	0.00010	mg/L	0.0355	 		
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	 		
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	 		
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	 		
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0351	 		
calcium, total	7440-70-2	E420	0.050	mg/L	252	 		
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00016	 		
cobalt, total	7440-48-4	E420	0.10	μg/L	0.15	 		
copper, total	7440-50-8	E420	0.00050	mg/L	0.00052	 		
iron, total	7439-89-6	E420	0.010	mg/L	0.101	 		
lead, total	7439-92-1	E420	0.000050	mg/L	0.000128	 		
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0219	 		
magnesium, total	7439-95-4	E420	0.0050	mg/L	220	 		
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0157	 		
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.000050	 		
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00175	 		
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0252	 		
potassium, total	7440-09-7	E420	0.050	mg/L	2.85	 		
selenium, total	7782-49-2	E420	0.050	μg/L	270	 		
silicon, total	7440-21-3	E420	0.10	mg/L	3.31	 		
silver, total	7440-21-6	E420	0.000010	mg/L	<0.000010	 		
sodium, total	7440-23-5	E420	0.050	mg/L	1.98	 		

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Work Order : CG2212409
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Total Motals Tota	Water			Cli	ent sample ID	RG_GHNF_WS_	 		
Total Metale	ater)								
Total Metals Total Metals T440-24-6 E420 0.00020 mg/L 0.168				Client samp	ling date / time		 		
Total Metals Trotal Metals		CAS Number	Method	LOR	Unit				
Strontum, total 7440-24-6	als					rtesuit	 		
thallium, total 7440-28-0 E420 0.000010 mg/L 0.000019 <t< th=""><th></th><th>7440-24-6</th><th>E420</th><th>0.00020</th><th>mg/L</th><th>0.168</th><th> </th><th></th><th></th></t<>		7440-24-6	E420	0.00020	mg/L	0.168	 		
titanium, total 7440-31-5 E420 0.00010 mg/L <0.00010	al	7704-34-9	E420	0.50	mg/L	413	 		
titanium, total 7440-32-6 E420 0.00030 mg/L 0.00079	otal	7440-28-0	E420	0.000010	mg/L	0.000019	 		
uranium, total 7440-61-1 E420 0.000010 mg/L 0.0146 .		7440-31-5	E420	0.00010	mg/L	<0.00010	 		
vanadium, total 7446-62-2 E420 0.00050 mg/L <0.00050 <th< td=""><td>otal</td><td>7440-32-6</td><td>E420</td><td>0.00030</td><td>mg/L</td><td>0.00079</td><td> </td><td></td><td></td></th<>	otal	7440-32-6	E420	0.00030	mg/L	0.00079	 		
Dissolved Metals Section Secti	otal	7440-61-1	E420	0.000010	mg/L	0.0146	 		
Dissolved Metals aluminum, dissolved 7429-90-5 E421 0.0010 mg/L <0.0010	, total	7440-62-2	E420	0.00050	mg/L	<0.00050	 		
aluminum, dissolved		7440-66-6	E420	0.0030	mg/L	0.0033	 		
antimony, dissolved 7440-36-0 E421 0.00010 mg/L 0.00077	d Metals								
arsenic, dissolved 7440-38-2 E421 0.00010 mg/L 0.00020	, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	 		
barium, dissolved 7440-39-3	dissolved	7440-36-0	E421	0.00010	mg/L	0.00077	 		
Deryllium, dissolved	issolved	7440-38-2	E421	0.00010	mg/L	0.00020	 		
bismuth, dissolved 7440-69-9 E421 0.000050 mg/L <0.000050	ssolved	7440-39-3	E421	0.00010	mg/L	0.0365	 		
boron, dissolved 7440-42-8 E421 0.010 mg/L <0.010 .	dissolved	7440-41-7	E421	0.020	μg/L	<0.020	 		
cadmium, dissolved 7440-43-9 E421 0.0050 μg/L <0.0050 <	dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	 		
calcium, dissolved 7440-70-2 E421 0.050 mg/L 249	solved	7440-42-8	E421	0.010	mg/L	<0.010	 		
chromium, dissolved 7440-47-3 E421.Cr-L 0.00010 mg/L <0.00010	dissolved	7440-43-9	E421	0.0050	μg/L	<0.0050	 		
cobalt, dissolved 7440-48-4 E421 0.10 μg/L <0.10	lissolved	7440-70-2	E421	0.050	mg/L	249	 		
copper, dissolved 7440-50-8 E421 0.00020 mg/L 0.00027 <t< td=""><td>, dissolved</td><td>7440-47-3</td><td>E421.Cr-L</td><td>0.00010</td><td>mg/L</td><td><0.00010</td><td> </td><td></td><td></td></t<>	, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	 		
iron, dissolved 7439-89-6 E421 0.010 mg/L <0.010	solved	7440-48-4	E421	0.10	μg/L	<0.10	 		
lead, dissolved 7439-92-1 E421 0.000050 mg/L <0.000050 lithium, dissolved 7439-93-2 E421 0.0010 mg/L 0.0167 magnesium, dissolved 7439-95-4 E421 0.0050 mg/L 201 manganese, dissolved 7439-96-5 E421 0.00010 mg/L 0.00786	ssolved	7440-50-8	E421	0.00020	mg/L	0.00027	 		
lithium, dissolved 7439-93-2 E421 0.0010 mg/L 0.0167 magnesium, dissolved 7439-95-4 E421 0.0050 mg/L 201 manganese, dissolved 7439-96-5 E421 0.00010 mg/L 0.00786	plved	7439-89-6	E421	0.010	mg/L	<0.010	 		
magnesium, dissolved 7439-95-4 E421 0.0050 mg/L 201 manganese, dissolved 7439-96-5 E421 0.00010 mg/L 0.00786	olved	7439-92-1	E421	0.000050	mg/L	<0.000050	 		
manganese, dissolved 7439-96-5 E421 0.00010 mg/L 0.00786	ssolved	7439-93-2	E421	0.0010	mg/L	0.0167	 		
	m, dissolved	7439-95-4	E421	0.0050	mg/L	201	 		
marcury discaland 7420.07.6 E500 0.000050 mg/l <0.000050	e, dissolved	7439-96-5	E421	0.00010	mg/L	0.00786	 		
mercury, dissolved	dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	 		
molybdenum, dissolved 7439-98-7 E421 0.000050 mg/L 0.00193	um, dissolved	7439-98-7	E421	0.000050	mg/L	0.00193	 		
nickel, dissolved 7440-02-0 E421 0.00050 mg/L 0.0222	solved	7440-02-0	E421	0.00050	mg/L	0.0222	 		
potassium, dissolved 7440-09-7 E421 0.050 mg/L 3.03	ı, dissolved	7440-09-7	E421	0.050	mg/L	3.03	 		

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Analytical Results

Sub-Matrix: Water			CI	ient sample ID	RG_GHNF_WS_	 	
(Matrix: Water)					LAEMP_GC_20 22-09_N		
			Client samp	ling date / time	09-Sep-2022 13:05	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212409-001	 	
					Result	 	
Dissolved Metals							
selenium, dissolved	7782-49-2	E421	0.050	μg/L	271	 	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.26	 	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	 	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.93	 	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.181	 	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	257	 	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	 	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	 	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	 	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0136	 	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	 	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	 	
dissolved mercury filtration location		EP509	-	-	Field	 	
dissolved metals filtration location		EP421	-	-	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

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Client : Teck Coal Limited : Aboratory : Calgary - Environmental Contact : Giovanna Diaz : Lyudmyla Shvets

: 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

 Telephone
 : -- Telephone
 : +1 403 407 1800

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 13-Sep-2022 09:11

 PO
 : VPO00816101
 Issue Date
 : 15-Sep-2022 15:28

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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

Key

Address

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers: Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



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Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					Ev	aluation: 🗴 = 🛭	Holding time exce	edance ; 🔻	= Withir	Holding Time
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_GHNF_WS_LAEMP_GC_2022-09_N	E298	09-Sep-2022	13-Sep-2022				13-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.Br-L	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.CI-L	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Le	vel 0.001									
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E378-U	09-Sep-2022	13-Sep-2022				13-Sep-2022	3 days	4 days	* EHTR-FM
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.F	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.NO3-L	09-Sep-2022	14-Sep-2022	3 days	5 days	# EHTR	14-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.NO2-L	09-Sep-2022	14-Sep-2022				14-Sep-2022	3 days	5 days	* EHTR-FM

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Matrix: **Water**Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

Matrix: Water		Evaluation. * - Holding time exceedance, * - vvi							Till Holding Til		
Analyte Group	Method	Sampling Date	Ext	raction / Pr	reparation		Analysis				
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval	
			Date	Rec	Actual			Rec	Actual		
Anions and Nutrients : Sulfate in Water by IC											
HDPE											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E235.SO4	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	✓	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid)											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E318	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	✓	
							·				
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)											
Amber glass total (sulfuric acid)											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E372-U	09-Sep-2022	14-Sep-2022				15-Sep-2022	28 days	6 days	✓	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE - dissolved (lab preserved)											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E421.Cr-L	09-Sep-2022	14-Sep-2022				14-Sep-2022	180	5 days	✓	
		·	·				·	days			
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid)											
RG GHNF WS LAEMP GC 2022-09 N	E509	09-Sep-2022	14-Sep-2022				14-Sep-2022	28 days	5 days	1	
		·	·				,	,	,		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE - dissolved (lab preserved)											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E421	09-Sep-2022	14-Sep-2022				14-Sep-2022	180	5 days	✓	
		·					·	days			
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Lev	el)										
Amber glass dissolved (sulfuric acid)											
RG_GHNF_WS_LAEMP_GC_2022-09_N	E358-L	09-Sep-2022	13-Sep-2022				14-Sep-2022	28 days	4 days	✓	
		·	·				,	,	,		
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combusti	on (Low Level)										
Amber glass total (sulfuric acid)	l (Low Level)										
RG_GHNF_WS_LAEMP_GC_2022-09_N	E355-L	09-Sep-2022	13-Sep-2022				14-Sep-2022	28 days	4 davs	1	
		' '					' ' -				
Physical Tests : Acidity by Titration											
HDPE											
	1	1					I			l .	
RG_GHNF_WS_LAEMP_GC_2022-09_N	E283	09-Sep-2022	14-Sep-2022				14-Sep-2022	14 days	5 davs	✓	

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Matrix: Water Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Analyte Group Method Sampling Date Extraction / Preparation Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Physical Tests: Alkalinity Species by Titration HDPE E290 09-Sep-2022 14-Sep-2022 14-Sep-2022 14 days 5 days ✓ RG_GHNF_WS_LAEMP_GC_2022-09_N Physical Tests : Conductivity in Water HDPE ✓ RG_GHNF_WS_LAEMP_GC_2022-09_N E100 09-Sep-2022 14-Sep-2022 14-Sep-2022 28 days 5 days --------Physical Tests: ORP by Electrode **HDPE** RG_GHNF_WS_LAEMP_GC_2022-09_N E125 09-Sep-2022 14-Sep-2022 118 hrs 0.25 hrs EHTR-FM Physical Tests : pH by Meter HDPE RG GHNF WS LAEMP GC 2022-09 N E108 09-Sep-2022 14-Sep-2022 14-Sep-2022 0.25 0.26 EHTR-FM hrs hrs **Physical Tests: TDS by Gravimetry** HDPE E162 09-Sep-2022 ✓ 14-Sep-2022 7 days 5 days RG_GHNF_WS_LAEMP_GC_2022-09_N Physical Tests: TSS by Gravimetry (Low Level) HDPE E160-L 09-Sep-2022 ✓ RG_GHNF_WS_LAEMP_GC_2022-09_N 14-Sep-2022 7 days 5 days **Physical Tests: Turbidity by Nephelometry HDPE** E121 09-Sep-2022 13-Sep-2022 æ RG_GHNF_WS_LAEMP_GC_2022-09_N 3 days 4 days **EHTR** Total Metals: Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) E420.Cr-L ✓ RG_GHNF_WS_LAEMP_GC_2022-09_N 09-Sep-2022 14-Sep-2022 14-Sep-2022 180 5 days days **Total Metals: Total Mercury in Water by CVAAS** Glass vial total (hydrochloric acid) RG GHNF WS LAEMP GC 2022-09 N E508 09-Sep-2022 14-Sep-2022 14-Sep-2022 28 days 5 days ✓ --------

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Matrix: Water Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Analyte Group	Method		Analysis							
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GHNF_WS_LAEMP_GC_2022-09_N	E420	09-Sep-2022	14-Sep-2022				14-Sep-2022	180 days	5 days	✓

Legend & Qualifier Definitions

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

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			Co	ount	Frequency (%)			
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)								
Acidity by Titration	E283	646040	1	9	11.1	5.0	1	
Alkalinity Species by Titration	E290	646035	1	20	5.0	5.0	_	
Ammonia by Fluorescence	E298	645526	1	9	11.1	5.0	√	
Bromide in Water by IC (Low Level)	E235.Br-L	645945	1	3	33.3	5.0	1	
Chloride in Water by IC (Low Level)	E235.CI-L	645946	1	3	33.3	5.0	✓	
Conductivity in Water	E100	646037	1	5	20.0	5.0	✓	
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	646741	1	18	5.5	5.0	✓	
Dissolved Mercury in Water by CVAAS	E509	647532	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	646742	1	18	5.5	5.0	✓	
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	645441	1	9	11.1	5.0	✓	
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	645469	1	3	33.3	5.0	✓	
Fluoride in Water by IC	E235.F	645942	1	15	6.6	5.0	✓	
Nitrate in Water by IC (Low Level)	E235.NO3-L	645947	1	3	33.3	5.0	✓	
Nitrite in Water by IC (Low Level)	E235.NO2-L	645948	1	3	33.3	5.0	✓	
ORP by Electrode	E125	646219	1	9	11.1	5.0	✓	
pH by Meter	E108	646036	1	5	20.0	5.0	✓	
Sulfate in Water by IC	E235.SO4	645941	1	15	6.6	5.0	✓	
TDS by Gravimetry	E162	647154	1	11	9.0	5.0	✓	
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	646084	1	5	20.0	5.0	✓	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	645448	1	9	11.1	5.0	✓	
Total Mercury in Water by CVAAS	E508	647531	1	13	7.6	5.0	✓	
Total Metals in Water by CRC ICPMS	E420	646083	1	6	16.6	5.0	✓	
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	645442	1	9	11.1	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	646476	1	9	11.1	5.0	✓	
Turbidity by Nephelometry	E121	645422	1	3	33.3	5.0	✓	
Laboratory Control Samples (LCS)								
Acidity by Titration	E283	646040	1	9	11.1	5.0	✓	
Alkalinity Species by Titration	E290	646035	1	20	5.0	5.0	✓	
Ammonia by Fluorescence	E298	645526	1	9	11.1	5.0	✓	
Bromide in Water by IC (Low Level)	E235.Br-L	645945	1	3	33.3	5.0	✓	
Chloride in Water by IC (Low Level)	E235.CI-L	645946	1	3	33.3	5.0	✓	
Conductivity in Water	E100	646037	1	5	20.0	5.0	✓	
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	646741	1	18	5.5	5.0	✓	
Dissolved Mercury in Water by CVAAS	E509	647532	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	646742	1	18	5.5	5.0	✓	
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	645441	1	9	11.1	5.0	✓	
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	645469	1	3	33.3	5.0	1	

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Matrix: Water		Lvaluati	on: × = QC frequ		terrication, V =		· · · · · · · · · · · · · · · · · · ·
Quality Control Sample Type				ount		Frequency (%)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	645942	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	645947	1	3	33.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	645948	1	3	33.3	5.0	✓
ORP by Electrode	E125	646219	1	9	11.1	5.0	✓
pH by Meter	E108	646036	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	645941	1	15	6.6	5.0	✓
TDS by Gravimetry	E162	647154	1	11	9.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	646084	1	5	20.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	645448	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	647531	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	646083	1	6	16.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	645442	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	646476	1	9	11.1	5.0	1
TSS by Gravimetry (Low Level)	E160-L	647137	1	17	5.8	5.0	1
Turbidity by Nephelometry	E121	645422	1	3	33.3	5.0	1
Method Blanks (MB)							
Acidity by Titration	E283	646040	1	9	11.1	5.0	1
Alkalinity Species by Titration	E290	646035	1	20	5.0	5.0	1
Ammonia by Fluorescence	E298	645526	1	9	11.1	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	645945	1	3	33.3	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	645946	1	3	33.3	5.0	√
Conductivity in Water	E100	646037	1	5	20.0	5.0	<u> </u>
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	646741	1	18	5.5	5.0	√
Dissolved Mercury in Water by CVAAS	E509	647532	1	13	7.6	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	646742	1	18	5.5	5.0	√
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	645441	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	645469	1	3	33.3	5.0	1
Fluoride in Water by IC	E235.F	645942	1	15	6.6	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	645947	1	3	33.3	5.0	√
Nitrite in Water by IC (Low Level)	E235.NO2-L	645948	1	3	33.3	5.0	√
Sulfate in Water by IC	E235.SO4	645941	1	15	6.6	5.0	1
TDS by Gravimetry	E162	647154	1	11	9.0	5.0	√
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	646084	1	5	20.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	645448	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	647531	1	13	7.6	5.0	√
Total Metals in Water by CRC ICPMS	E420	646083	1	6	16.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	645442	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	646476	1	9	11.1	5.0	✓
TSS by Gravimetry (Low Level)	E372-0 E160-L	647137	1	17	5.8	5.0	
Turbidity by Nephelometry	E160-L E121	645422	1	3	33.3	5.0	√

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Project : REGIONAL EFFECTS PROGRAM



Matrix: Water Evaluation: × = QC frequency outside specification, ✓ = QC frequency within specification.

Wattis. Water		Lvaidati	on Qo nega	chey outside spe	concation, · -	go nequency wit	min specimeatio
Quality Control Sample Type			Co	ount			
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	645526	1	9	11.1	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	645945	1	3	33.3	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	645946	1	3	33.3	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	646741	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	647532	1	13	7.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	646742	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	645441	1	9	11.1	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	645469	1	3	33.3	5.0	✓
Fluoride in Water by IC	E235.F	645942	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	645947	1	3	33.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	645948	1	3	33.3	5.0	✓
Sulfate in Water by IC	E235.SO4	645941	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	646084	1	5	20.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	645448	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	647531	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	646083	1	6	16.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	645442	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	646476	1	9	11.1	5.0	✓

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Project : REGIONAL EFFECTS PROGRAM



Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water
	Calgary - Environmental			sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted
	Calgary - Environmental			at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results,
Trushidita ha Nasahalasa 4m.	0 7	\A/-4	A DUI A 0400 D ()	pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
	Calgary - Environmental			scatter under defined conditions.
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the
				platinum metal-reference electrode employed, measured in mV. For high accuracy test
	Calgary - Environmental			results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
				filter, following by drying of the filter at $104 \pm 1^{\circ}$ C, with gravimetric measurement of the
	Calgary - Environmental			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre
	2102		,	filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Colorani. Faringana antal			detection.
Chlorida in Water by IC (Levy Leval)	Calgary - Environmental	Water	EDA 200.1 (mad)	
Chloride in Water by IC (Low Level)	E235.CI-L	water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
	Calgary - Environmental			detection.
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
I with a te in water by 10 (Low Level)	E235.NO3-L	vvater	Li A 300.1 (mod)	detection.
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Calgary - Environmental			
	Jaigary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.



QUALITY CONTROL REPORT

Work Order : CG2212409

Client : Teck Coal Limited
Contact : Giovanna Diaz
Address : 421 Pine Avenue

: 421 Pine Avenue Sparwood BC Canada V0B2G0

Telephone : ----

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site :--

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone :+1 403 407 1800

Date Samples Received : 13-Sep-2022 09:11

Date Analysis Commenced : 13-Sep-2022

Issue Date :15-Sep-2022 15:28

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

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department	
Elke Tabora		Calgary Inorganics, Calgary, Alberta	
Kevin Baxter		Calgary Metals, Calgary, Alberta	
Parker Sgarbossa	Laboratory Analyst	Calgary Inorganics, Calgary, Alberta	
Ruifang Zheng	Analyst	Calgary Inorganics, Calgary, Alberta	
Sara Niroomand		Calgary Inorganics, Calgary, Alberta	
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Sonthuong Bui	Laboratory Analyst	Calgary Metals, Calgary, Alberta	
Vladka Stamenova	Analyst	Calgary Inorganics, Calgary, Alberta	

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 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

ub-Matrix: Water					Laboratory Duplicate (DUP) Report						
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Physical Tests (QC	Lot: 645422)										
CG2212408-001	Anonymous	turbidity		E121	0.10	NTU	0.11	0.11	0.001	Diff <2x LOR	
Physical Tests (QC	Lot: 646035)										
CG2212400-003	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	575	594	3.33%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	2.0	mg/L	575	594	3.33%	20%	
Physical Tests (QC	Lot: 646036)										
CG2212407-001	Anonymous	pH		E108	0.10	pH units	8.38	8.38	0.00%	4%	
Physical Tests (QC	Lot: 646037)										
CG2212407-001	Anonymous	conductivity		E100	2.0	μS/cm	769	762	0.914%	10%	
Physical Tests (QC	Lot: 646040)										
CG2212395-001	Anonymous	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	
Physical Tests (QC	Lot: 646219)										
CG2212395-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	313	315	0.541%	15%	
Physical Tests (QC	Lot: 647154)										
CG2212395-001	Anonymous	solids, total dissolved [TDS]		E162	40	mg/L	529	542	2.43%	20%	
	ts (QC Lot: 645448)										
CG2212395-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	
	ts (QC Lot: 645469)										
CG2212408-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 645526)										
CG2212395-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 645941)										
CG2212394-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	489	487	0.390%	20%	
	ts (QC Lot: 645942)										
CG2212394-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.181	0.185	0.004	Diff <2x LOR	
nions and Nutrien	ts (QC Lot: 645945)										
CG2212408-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	
	ts (QC Lot: 645946)										
CG2212408-001	Anonymous	chloride	16887-00-6	E235.CI-L	0.10	mg/L	2.64	2.64	0.121%	20%	

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 Client
 : Teck Coal Limited



Sub-Matrix: Water	Matrix: Water						Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie	
Inions and Nutrie	nts (QC Lot: 645947) - continued										
CG2212408-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	11.2	11.2	0.127%	20%		
nions and Nutrie	nts (QC Lot: 645948)										
CG2212408-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0039	0.0038	0.0001	Diff <2x LOR		
Anions and Nutrie	nts (QC Lot: 646476)										
CG2212395-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0071	0.0072	0.00009	Diff <2x LOR		
Organic / Inorgani	c Carbon (QC Lot: 6	45441)										
CG2212395-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR		
Organic / Inorgani	c Carbon (QC Lot: 6	45442)										
CG2212395-001	Anonymous	carbon, total organic [TOC]		E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR		
otal Metals (QC L	Lot: 646083)											
CG2212407-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0046	0.0048	0.0002	Diff <2x LOR		
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00011	0.00010	0.000007	Diff <2x LOR		
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	0.00012	0.00002	Diff <2x LOR		
		barium, total	7440-39-3	E420	0.00010	mg/L	0.109	0.108	1.48%	20%		
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR		
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR		
		boron, total	7440-42-8	E420	0.010	mg/L	0.011	0.010	0.0001	Diff <2x LOR		
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0284 μg/L	0.0000292	0.0000008	Diff <2x LOR		
		calcium, total	7440-70-2	E420	0.050	mg/L	97.2	98.5	1.30%	20%		
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR		
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR		
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR		
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR		
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0322	0.0312	3.20%	20%		
		magnesium, total	7439-95-4	E420	0.0050	mg/L	45.2	44.6	1.36%	20%		
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00160	0.00147	8.14%	20%		
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00128	0.00128	0.270%	20%		
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00096	0.00088	0.00008	Diff <2x LOR		
		potassium, total	7440-09-7	E420	0.050	mg/L	1.30	1.28	1.35%	20%		
		selenium, total	7782-49-2	E420	0.000050	mg/L	50.0 μg/L	0.0474	5.39%	20%		
		silicon, total	7440-21-3	E420	0.10	mg/L	2.17	2.15	0.874%	20%		
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR		
		sodium, total	7440-23-5	E420	0.050	mg/L	2.80	2.79	0.0809%	20%		
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.145	0.145	0.295%	20%		
		sulfur, total	7704-34-9	E420	0.50	mg/L	68.2	68.4	0.334%	20%		

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Sub-Matrix: Water		Laboratory Duplicate (DUP) Report									
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Total Metals (QC Lo	ot: 646083) - continue	ed									
CG2212407-001	Anonymous	thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00220	0.00216	2.03%	20%	
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	
Total Metals (QC Lo	ot: 646084)										
CG2212407-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00012	0.00016	0.00003	Diff <2x LOR	
Total Metals (QC Lo	ot: 647531)										
CG2212395-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (0	QC Lot: 646741)										
CG2212207-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
Dissolved Metals (QC Lot: 646742)										
CG2212207-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00065	0.00067	0.00002	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00010	<0.00010	0.000003	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0502	0.0508	1.31%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.031	0.032	0.0007	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0869 µg/L	0.0000969	10.9%	20%	
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	223	228	2.24%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.306	0.305	0.501%	20%	
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	125	128	2.52%	20%	
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00044	0.00048	0.00005	Diff <2x LOR	
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00269	0.00280	3.97%	20%	
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00659	0.00652	1.04%	20%	
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	6.59	6.77	2.82%	20%	
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	128 µg/L	0.135	5.63%	20%	
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.60	2.66	2.27%	20%	
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	

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Sub-Matrix: Water							Labora	tory Duplicate (DU	JP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 646742) - contin	ued									
CG2212207-001	Anonymous	sodium, dissolved	7440-23-5	E421	0.050	mg/L	10.8	11.1	2.46%	20%	
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.381	0.392	2.84%	20%	
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	179	188	4.75%	20%	
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0113	0.0116	2.59%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0031	0.0032	0.00007	Diff <2x LOR	
Dissolved Metals (QC Lot: 647532)										
CG2212395-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.000050	0	Diff <2x LOR	

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Method Blank (MB) Report

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

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 645422)					
urbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 646035)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 646037)					
conductivity	E100	1	μS/cm	1.2	
Physical Tests (QCLot: 646040)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 647137)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 647154)					
olids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 645448)					
(jeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 645469)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 645526)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 645941)					
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 645942)					
luoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 645945)					
promide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 645946)					
hloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 645947)					
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 645948)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 646476)					

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	CAR Normal and Market and	100	11 14		O1151
Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 6464 phosphorus, total	76) - continued 7723-14-0 E372-U	0.002	mg/L	<0.0020	
		0.002	mg/L	10.0020	
Organic / Inorganic Carbon (QCLot carbon, dissolved organic [DOC]	: 645441) E358-L	0.5	mg/L	<0.50	
		0.0	mg/L	-0.00	
Organic / Inorganic Carbon (QCLot carbon, total organic [TOC]	: 645442) E355-L	0.5	mg/L	<0.50	
	2000 2	0.0	mg/L	-0.00	
Total Metals (QCLot: 646083) aluminum, total	7429-90-5 E420	0.003	mg/L	<0.0030	
antimony, total	7440-36-0 E420	0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2 E420	0.0001	mg/L	<0.00010	
barium, total	7440-39-3 E420	0.0001	mg/L	<0.00010	
beryllium, total	7440-41-7 E420	0.00002	mg/L	<0.000020	
bismuth, total	7440-69-9 E420	0.00005	mg/L	<0.000050	
boron, total	7440-42-8 E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9 E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2 E420	0.05	mg/L	<0.050	
cobalt, total	7440-48-4 E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8 E420	0.0005	mg/L	<0.00050	
iron, total	7439-89-6 E420	0.01	mg/L	<0.010	
lead, total	7439-92-1 E420	0.00005	mg/L	<0.000050	
lithium, total	7439-93-2 E420	0.001	mg/L	<0.0010	
magnesium, total	7439-95-4 E420	0.005	mg/L	<0.0050	
manganese, total	7439-96-5 E420	0.0001	mg/L	<0.00010	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	<0.000050	
nickel, total	7440-02-0 E420	0.0005	mg/L	<0.00050	
potassium, total	7440-09-7 E420	0.05	mg/L	<0.050	
selenium, total	7782-49-2 E420	0.00005	mg/L	<0.000050	
silicon, total	7440-21-3 E420	0.1	mg/L	<0.10	
silver, total	7440-22-4 E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5 E420	0.05	mg/L	<0.050	
strontium, total	7440-24-6 E420	0.0002	mg/L	<0.00020	
sulfur, total	7704-34-9 E420	0.5	mg/L	<0.50	
thallium, total	7440-28-0 E420	0.00001	mg/L	<0.000010	
tin, total	7440-31-5 E420	0.0001	mg/L	<0.00010	
titanium, total	7440-32-6 E420	0.0003	mg/L	<0.00030	
uranium, total	7440-61-1 E420	0.00001	mg/L	<0.000010	
vanadium, total	7440-62-2 E420	0.0005	mg/L	<0.00050	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 646083) - contin					
zinc, total	7440-66-6 E420	0.003	mg/L	<0.0030	
Total Metals (QCLot: 646084)					
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 647531)					
mercury, total	7439-97-6 E508	0.000005	mg/L	<0.000050	
Dissolved Metals (QCLot: 646741)					
chromium, dissolved	7440-47-3 E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 646742)					
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	<0.00010	
barium, dissolved	7440-39-3 E421	0.0001	mg/L	<0.00010	
beryllium, dissolved	7440-41-7 E421	0.00002	mg/L	<0.000020	
bismuth, dissolved	7440-69-9 E421	0.00005	mg/L	<0.000050	
boron, dissolved	7440-42-8 E421	0.01	mg/L	<0.010	
cadmium, dissolved	7440-43-9 E421	0.000005	mg/L	<0.000050	
calcium, dissolved	7440-70-2 E421	0.05	mg/L	<0.050	
cobalt, dissolved	7440-48-4 E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8 E421	0.0002	mg/L	<0.00020	
iron, dissolved	7439-89-6 E421	0.01	mg/L	<0.010	
lead, dissolved	7439-92-1 E421	0.00005	mg/L	<0.000050	
ithium, dissolved	7439-93-2 E421	0.001	mg/L	<0.0010	
magnesium, dissolved	7439-95-4 E421	0.005	mg/L	<0.0050	
manganese, dissolved	7439-96-5 E421	0.0001	mg/L	<0.00010	
molybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	<0.00050	
potassium, dissolved	7440-09-7 E421	0.05	mg/L	<0.050	
selenium, dissolved	7782-49-2 E421	0.00005	mg/L	<0.000050	
silicon, dissolved	7440-21-3 E421	0.05	mg/L	<0.050	
silver, dissolved	7440-22-4 E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5 E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9 E421	0.5	mg/L	<0.50	
thallium, dissolved	7440-28-0 E421	0.00001	mg/L	<0.000010	
tin, dissolved	7440-31-5 E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6 E421	0.0003	mg/L	<0.00030	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier					
Dissolved Metals (QCLot: 646742) - contin	ued									
uranium, dissolved	7440-61-1 E421	0.00001	mg/L	<0.000010						
vanadium, dissolved	7440-62-2 E421	0.0005	mg/L	<0.00050						
zinc, dissolved	7440-66-6 E421	0.001	mg/L	<0.0010						
Dissolved Metals (QCLot: 647532)	Dissolved Metals (QCLot: 647532)									
mercury, dissolved	7439-97-6 E509	0.000005	mg/L	<0.000050						

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water						Laboratory Con	trol Sample (LCS)	Sample (LCS) Report Recovery Limits (%)			
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number Me	ethod	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Physical Tests (QCLot: 645422)											
turbidity	E1	21	0.1	NTU	200 NTU	106	85.0	115			
Physical Tests (QCLot: 646035)											
alkalinity, total (as CaCO3)	E2	290	1	mg/L	500 mg/L	104	85.0	115			
Physical Tests (QCLot: 646036)											
pH	E1	08		pH units	7 pH units	101	98.6	101			
Physical Tests (QCLot: 646037)											
conductivity	E1	00	1	μS/cm	146.9 μS/cm	96.9	90.0	110			
Physical Tests (QCLot: 646040)											
acidity (as CaCO3)	E2	283	2	mg/L	50 mg/L	104	85.0	115			
Physical Tests (QCLot: 646219)											
oxidation-reduction potential [ORP]	E1	25		mV	220 mV	102	95.4	104			
Physical Tests (QCLot: 647137)											
solids, total suspended [TSS]	E1	60-L	1	mg/L	150 mg/L	99.8	85.0	115			
Physical Tests (QCLot: 647154)											
solids, total dissolved [TDS]	E1	62	10	mg/L	1000 mg/L	99.0	85.0	115			
Anions and Nutrients (QCLot: 645448)											
Kjeldahl nitrogen, total [TKN]	E3	318	0.05	mg/L	4 mg/L	99.6	75.0	125			
Anions and Nutrients (QCLot: 645469)											
phosphate, ortho-, dissolved (as P)	14265-44-2 E3	378-U	0.001	mg/L	0.03 mg/L	96.8	80.0	120			
Anions and Nutrients (QCLot: 645526)											
ammonia, total (as N)	7664-41-7 E2	298	0.005	mg/L	0.2 mg/L	98.4	85.0	115			
Anions and Nutrients (QCLot: 645941)											
sulfate (as SO4)	14808-79-8 E2	235.SO4	0.3	mg/L	100 mg/L	102	90.0	110			
Anions and Nutrients (QCLot: 645942)											
fluoride	16984-48-8 E2	235.F	0.02	mg/L	1 mg/L	103	90.0	110			
Anions and Nutrients (QCLot: 645945)											
promide	24959-67-9 E2	235.Br-L	0.05	mg/L	0.5 mg/L	104	85.0	115			
Anions and Nutrients (QCLot: 645946)											
chloride	16887-00-6 E2	235.CI-L	0.1	mg/L	100 mg/L	101	90.0	110			
Anions and Nutrients (QCLot: 645947)									1		
nitrate (as N)	14797-55-8 E2	235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110			
Anions and Nutrients (QCLot: 645948)									1		

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Sub-Matrix: Water						Laboratory Co	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 645948) - continued									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 646476)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.03 mg/L	94.4	80.0	120	
Organic / Inorganic Carbon (QCLot: 645441)									
carbon, dissolved organic [DOC]		E358-L	0.5	mg/L	8.57 mg/L	103	80.0	120	
Organic / Inorganic Carbon (QCLot: 645442)									
carbon, total organic [TOC]		E355-L	0.5	mg/L	8.57 mg/L	105	80.0	120	
Total Metals (QCLot: 646083)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.5	80.0	120	
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	95.8	80.0	120	
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	93.0	80.0	120	
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	96.0	80.0	120	
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	95.5	80.0	120	
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	80.0	120	
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	92.3	80.0	120	
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	94.6	80.0	120	
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	93.0	80.0	120	
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	93.9	80.0	120	
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	93.0	80.0	120	
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120	
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	102	80.0	120	
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	96.2	80.0	120	
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	96.5	80.0	120	
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	93.9	80.0	120	
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	97.2	80.0	120	
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	90.8	80.0	120	
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	103	60.0	140	
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	83.2	80.0	120	
sodium, total	7440-23-5		0.05	mg/L	50 mg/L	98.3	80.0	120	
strontium, total	7440-24-6		0.0002	mg/L	0.25 mg/L	95.7	80.0	120	
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.9	80.0	120	
thallium, total	7440-28-0		0.00001	mg/L	1 mg/L	97.8	80.0	120	
tin, total	7440-31-5		0.0001	mg/L	0.5 mg/L	96.1	80.0	120	
				J	5.5g, <u>-</u>			1	

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 Work Order
 : CG2212409

 Client
 : Teck Coal Limited



Sub-Matrix: Water					Laboratory Control Sample (LCS) Report					
					Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Total Metals (QCLot: 646083) - continued										
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	91.7	80.0	120		
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	91.5	80.0	120		
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	94.1	80.0	120		
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	91.0	80.0	120		
Total Metals (QCLot: 646084)										
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	95.9	80.0	120		
Total Metals (QCLot: 647531)										
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	100	80.0	120		
Dissolved Metals (QCLot: 646741)										
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.0	80.0	120		
Dissolved Metals (QCLot: 646742)										
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	103	80.0	120		
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120		
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.1	80.0	120		
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.7	80.0	120		
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	106	80.0	120		
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.2	80.0	120		
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	98.6	80.0	120		
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.8	80.0	120		
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	95.4	80.0	120		
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	96.0	80.0	120		
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	96.5	80.0	120		
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	108	80.0	120		
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.7	80.0	120		
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	91.7	80.0	120		
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	94.9	80.0	120		
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	96.4	80.0	120		
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	99.5	80.0	120		
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	94.7	80.0	120		
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.2	80.0	120		
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	90.2	80.0	120		
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	100	60.0	140		
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	89.0	80.0	120		
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	99.7	80.0	120		
• Control of the cont	1110 20 0									
strontium, dissolved	7440-24-6		0.0002	mg/L	0.25 mg/L	101	80.0	120		

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 Work Order
 : CG2212409

 Client
 : Teck Coal Limited



Sub-Matrix: Water	Matrix: Water						0.00001 mg/L 1 mg/L 99.4 80.0 120 0.0001 mg/L 0.5 mg/L 97.2 80.0 120 0.0003 mg/L 0.25 mg/L 98.8 80.0 120 0.00001 mg/L 0.005 mg/L 96.2 80.0 120 0.0005 mg/L 0.5 mg/L 99.8 80.0 120 0.0005 mg/L 0.5 mg/L 103 80.0 120 0.001 mg/L 0.5 mg/L 103 80.0 120		
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 646742) - cor	ntinued								
thallium, dissolved	7440-28-0 E	E421	0.00001	mg/L	1 mg/L	99.4	80.0	120	
tin, dissolved	7440-31-5 E	E421	0.0001	mg/L	0.5 mg/L	97.2	80.0	120	
titanium, dissolved	7440-32-6 E	E421	0.0003	mg/L	0.25 mg/L	98.8	80.0	120	
uranium, dissolved	7440-61-1 E	E421	0.00001	mg/L	0.005 mg/L	96.2	80.0	120	
vanadium, dissolved	7440-62-2 E	E421	0.0005	mg/L	0.5 mg/L	99.8	80.0	120	
zinc, dissolved	7440-66-6 E	E421	0.001	mg/L	0.5 mg/L	103	80.0	120	
mercury, dissolved	7439-97-6 E	E509	0.000005	mg/L	0.0001 mg/L	104	80.0	120	

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 Work Order
 : CG2212409

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 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

Spike Recovery (File Recovery (Fil	Sub-Matrix: Water	atrix: Water Matrix Spike (MS) Report									
Comparison Com						Spi	ike	Recovery (%)	Recovery	Limits (%)	
Section Control Cont		Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Intions and Nutrients (OCLot: 645469) GG22124969.01 R.G. GHRIP. W.S. LAEMP. G. C. 202240.9 N. Anions and Nutrients (OCLot: 645526) GG2212395.002 Anonymous ammonia, total (as N) 7664-41.7 E298 0.109 mg/L 0.1 mg/L 109 75.0 125 N. Anions and Nutrients (OCLot: 645526) GG2212395.002 Anonymous sulfate (as SO4) 14808-79-8 E235.SO4 ND mg/L 100 mg/L ND 75.0 125 N. Anions and Nutrients (OCLot: 645941) GG2212394.002 Anonymous sulfate (as SO4) 14808-79-8 E235.SO4 ND mg/L 100 mg/L ND 75.0 125 N. Anions and Nutrients (OCLot: 645942) GG2212394.002 Anonymous sulfate (as SO4) 14808-79-8 E235.SO4 ND mg/L 100 mg/L ND 75.0 125 N. Anions and Nutrients (OCLot: 645942) GG2212394.002 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645945) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645946) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645947) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645947) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645947) GG2212309-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-001 R.G. GHRIP. W.S. LAEMP. G. C. 2022-00 N. Anions and Nutrients (OCLot: 645948) GG2212409-0		ents (QCLot: 645448)									
CG2212409-001 RG_GRNF_WS_LAEMP_G Phosphate, orthor. dissolved (as P) 14265-44-2 E378-U 0.0462 mg/L 0.05 mg/L 92.4 70.0 130	CG2212395-002	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.54 mg/L	2.5 mg/L	101	70.0	130	
C_20229_N Anonymous ammonia, total (as N) 7664-41-7 E298 0.109 mg/L 0.1 mg/L 109 75.0 125 Anonymous ammonia, total (as N) 7664-41-7 E298 0.109 mg/L 0.1 mg/L 109 75.0 125 Anonymous sulfate (as SO4) 14808-79-8 E235 SO4 ND mg/L 100 mg/L ND 75.0 125 Anonymous sulfate (as SO4) 14808-79-8 E235 SO4 ND mg/L 100 mg/L ND 75.0 125 Anonymous sulfate (as SO4) 14808-79-8 E235 SO4 ND mg/L 100 mg/L ND 75.0 125 Anonymous sulfate (as SO4) 14808-79-8 E235 F 1.04 mg/L 1 mg/L 104 75.0 125 Anonymous sulfate (as SO4) 16884-48-8 E235 F 1.04 mg/L 1 mg/L 104 75.0 125 Anonymous SO2212409-001 RC_GINF_WS_LAERP_G cornide 24859-67-8 E235 Br-L 0.486 mg/L 0.5 mg/L 97.3 75.0 125 CG2212409-001 RC_GINF_WS_LAERP_G chloride 16887-00-6 E235 Cl-L 97.9 mg/L 100 mg/L 97.9 75.0 125 CG2212409-001 RC_GINF_WS_LAERP_G chloride 16887-00-6 E235 NO5-L ND mg/L 2.5 mg/L ND 75.0 125 CG2212409-001 RC_GINF_WS_LAERP_G chloride 14797-55-8 E235 NO5-L ND mg/L 2.5 mg/L ND 75.0 125 CG2212409-001 RC_GINF_WS_LAERP_G chloride 14797-55-8 E235 NO5-L ND mg/L 2.5 mg/L ND 75.0 125 CG2212398-001 RC_GINF_WS_LAERP_G chloride 14797-55-0 E235 NO5-L 0.489 mg/L 0.5 mg/L 99.9 75.0 125 CG2212398-001 RC_GINF_WS_LAERP_G chloride 14797-55-0 E235 NO5-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212398-001 RC_GINF_WS_LAERP_G chloride 14797-55-0 E235 NO5-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212398-001 RC_GINF_WS_LAERP_G chloride 7723-14-0 E372-U 0.0472 mg/L 0.05 mg/L 94.4 70.0 130 CG2212398-001 RC_GINF_WS_LAERP_G chloride carbon, dissolved organic [DOC] E386-L 5.72 mg/L 5 mg/L 114 70.0 130 CG2212398-001 Anonymous carbon, dissolved organic [DOC] E386-L 5.72 mg/L 5 mg/L 114 70.0 130 CG2212398-001 Anonymous carbon, dissolved organic [DOC]	Anions and Nutri	ents (QCLot: 645469)									
CG2212395-002	CG2212409-001		phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0462 mg/L	0.05 mg/L	92.4	70.0	130	
National Autrients QCLot: 645941	Anions and Nutri	ents (QCLot: 645526)									
CG2212394-002 Anonymous Sulfate (as SO4) 14808-79-8 E235.SO4 ND mg/L 100 mg/L ND 75.0 125	CG2212395-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.109 mg/L	0.1 mg/L	109	75.0	125	
Anions and Nutrients (QCLot: 645942) CG2212394-002 Anonymous fluoride 16984-48-8 E235.F 1.04 mg/L 1 mg/L 104 75.0 125 Anions and Nutrients (QCLot: 645945) CG2212499-001 RG_GFINF_WS_LAEMP_G C_2022-90 N 200 N	Anions and Nutri	ents (QCLot: 645941)									
CG2212394-002 Anonymous fluoride 16984-48-8 E235.F 1.04 mg/L 1 mg/L 104 75.0 125	CG2212394-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	
Anions and Nutrients (QCLot: 645945) CG2212409-001 RG_GHNF_WS_LAEMP_G C. 2022-09 N Anions and Nutrients (QCLot: 645946) CG2212409-001 RG_GHNF_WS_LAEMP_G C. 2022-09 N CG2212409-001 RG_GHNF_WS_LAEMP_G C. 2022-09 N Anions and Nutrients (QCLot: 645946) CG2212409-001 RG_GHNF_WS_LAEMP_G C. 2022-09 N Anions and Nutrients (QCLot: 645947) CG2212409-001 RG_GHNF_WS_LAEMP_G C. 2022-09 N Anions and Nutrients (QCLot: 645948) CG2212409-001 RG_GHNF_WS_LAEMP_G Notite (as N) 14797-55-8 E235 NO3-L ND mg/L 2.5 mg/L ND 75.0 125 Anions and Nutrients (QCLot: 645948) CG2212409-001 RG_GHNF_WS_LAEMP_G Notite (as N) 14797-65-0 E235 NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212409-001 RG_GHNF_WS_LAEMP_G Notite (as N) 14797-65-0 E235 NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212409-001 RG_GHNF_WS_LAEMP_G Notite (as N) 14797-65-0 E235 NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212409-001 RG_GHNF_WS_LAEMP_G Notite (as N) 14797-65-0 E235 NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 CG2212409-001 Anonymous phosphorus, total 7723-14-0 E372-U 0.0472 mg/L 0.05 mg/L 94.4 70.0 130 CG2212395-001 Anonymous carbon, dissolved organic [DOC] — E388-L 5.72 mg/L 5 mg/L 114 70.0 130 CG2212395-001 Anonymous carbon, dissolved organic [DOC] — E355-L 5.80 mg/L 5 mg/L 116 70.0 130 CG2212395-001 Anonymous carbon, total organic [TOC] — E355-L 5.80 mg/L 5 mg/L 116 70.0 130 CG2212395-001 Anonymous aluminum, total 7428-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Anions and Nutri	ents (QCLot: 645942)									
CG2212409-001 RG_GHNF_WS_LAEMP_G C_2022-09_N C_202	CG2212394-002	Anonymous	fluoride	16984-48-8	E235.F	1.04 mg/L	1 mg/L	104	75.0	125	
C 2022-09 Nanions and Nutrients (QCLot: 645946)	Anions and Nutri	ents (QCLot: 645945)									
RG_GHNF_WS_LAEMP_G	CG2212409-001		bromide	24959-67-9	E235.Br-L	0.486 mg/L	0.5 mg/L	97.3	75.0	125	
C_2022-09_N Anions and Nutrients (QCLot: 645947) CG2212409-001 RG_GHNF_WS_LAEMP_G C_2022-09_N Anions and Nutrients (QCLot: 645948) CG2212409-001 RG_GHNF_WS_LAEMP_G nitrite (as N) 14797-65-8 E235.NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 C_2022-09_N Anions and Nutrients (QCLot: 645948) CG2212409-001 RG_GHNF_WS_LAEMP_G C_2022-09_N nitrite (as N) 14797-65-0 E235.NO2-L 0.499 mg/L 0.5 mg/L 99.9 75.0 125 C_2022-09_N Anions and Nutrients (QCLot: 646476) CG2212395-002 Anonymous phosphorus, total 7723-14-0 E372-U 0.0472 mg/L 0.05 mg/L 94.4 70.0 130 Drganic / Inorganic Carbon (QCLot: 645441) CG2212395-001 Anonymous carbon, dissolved organic [DCC] E358-L 5.72 mg/L 5 mg/L 114 70.0 130 Drganic / Inorganic Carbon (QCLot: 645442) CG2212395-001 Anonymous carbon, total organic [TCC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Total Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Anions and Nutri	ents (QCLot: 645946)									
CG2212409-001 RG_GHNF_WS_LAEMP_G	CG2212409-001		chloride	16887-00-6	E235.CI-L	97.9 mg/L	100 mg/L	97.9	75.0	125	
C_2022-09_N Anions and Nutrients (QCLot: 645948) CG2212409-001 RG_GHNF_WS_LAEMP_G	Anions and Nutri	ents (QCLot: 645947)									
CG2212409-001 RG_GHNF_WS_LAEMP_G	CG2212409-001		nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	
C_2022-09_N Anions and Nutrients (QCLot: 646476) CG2212395-002 Anonymous phosphorus, total 7723-14-0 E372-U 0.0472 mg/L 0.05 mg/L 94.4 70.0 130 Drganic / Inorganic Carbon (QCLot: 645441) CG2212395-001 Anonymous carbon, dissolved organic [DOC] E358-L 5.72 mg/L 5 mg/L 114 70.0 130 Drganic / Inorganic Carbon (QCLot: 645442) CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Total Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Anions and Nutri	ents (QCLot: 645948)									
CG2212395-002 Anonymous phosphorus, total 7723-14-0 E372-U 0.0472 mg/L 0.05 mg/L 94.4 70.0 130 CG2212395-001 Anonymous carbon, dissolved organic [DOC] E358-L 5.72 mg/L 5 mg/L 114 70.0 130 CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 CG2212395-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	CG2212409-001		nitrite (as N)	14797-65-0	E235.NO2-L	0.499 mg/L	0.5 mg/L	99.9	75.0	125	
Organic / Inorganic Carbon (QCLot: 645441) CG2212395-001 Anonymous carbon, dissolved organic [DOC] E358-L 5.72 mg/L 5 mg/L 114 70.0 130 Organic / Inorganic Carbon (QCLot: 645442) CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Total Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Anions and Nutri	ents (QCLot: 646476)									
CG2212395-001 Anonymous carbon, dissolved organic [DOC] E358-L 5.72 mg/L 5 mg/L 114 70.0 130 Organic / Inorganic Carbon (QCLot: 645442) CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Fotal Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	CG2212395-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0472 mg/L	0.05 mg/L	94.4	70.0	130	
Organic / Inorganic Carbon (QCLot: 645442) E355-L 5.80 mg/L 5 mg/L 116 70.0 130 CG2212395-001 Anonymous Carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Fotal Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Organic / Inorgar	nic Carbon (QCLot: 645	441)								
CG2212395-001 Anonymous carbon, total organic [TOC] E355-L 5.80 mg/L 5 mg/L 116 70.0 130 Total Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	CG2212395-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	5.72 mg/L	5 mg/L	114	70.0	130	
Cotal Metals (QCLot: 646083) CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	Organic / Inorgar	nic Carbon (QCLot: 645	442)								
CG2212407-001 Anonymous aluminum, total 7429-90-5 E420 1.92 mg/L 2 mg/L 96.3 70.0 130	CG2212395-001	Anonymous	carbon, total organic [TOC]		E355-L	5.80 mg/L	5 mg/L	116	70.0	130	
	otal Metals (QC	Lot: 646083)									
antimony, total 7440-36-0 E420 0.186 mg/L 0.2 mg/L 93.2 70.0 130	CG2212407-001	Anonymous	aluminum, total	7429-90-5	E420	1.92 mg/L	2 mg/L	96.3	70.0	130	
		T .	antimony, total	7440-36-0	E420	0.186 mg/L	0.2 mg/L	93.2	70.0	130	

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 : Teck Coal Lir

Client : Teck Coal Limited
Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Water							Matrix Spik	e (MS) Report		
ous manne react.					Spi	ike	Recovery (%)		/ Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	CLot: 646083) - cont	inued								
CG2212407-001	Anonymous	arsenic, total	7440-38-2	E420	0.190 mg/L	0.2 mg/L	94.8	70.0	130	
		barium, total	7440-39-3	E420	0.178 mg/L	0.2 mg/L	88.8	70.0	130	
		beryllium, total	7440-41-7	E420	0.373 mg/L	0.4 mg/L	93.2	70.0	130	
		bismuth, total	7440-69-9	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	
		boron, total	7440-42-8	E420	0.899 mg/L	1 mg/L	89.9	70.0	130	
		cadmium, total	7440-43-9	E420	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.192 mg/L	0.2 mg/L	95.8	70.0	130	
		copper, total	7440-50-8	E420	0.194 mg/L	0.2 mg/L	97.0	70.0	130	
		iron, total	7439-89-6	E420	19.1 mg/L	20 mg/L	95.4	70.0	130	
		lead, total	7439-92-1	E420	0.203 mg/L	0.2 mg/L	102	70.0	130	
		lithium, total	7439-93-2	E420	0.934 mg/L	1 mg/L	93.4	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	0.194 mg/L	0.2 mg/L	96.9	70.0	130	
		molybdenum, total	7439-98-7	E420	0.199 mg/L	0.2 mg/L	99.5	70.0	130	
		nickel, total	7440-02-0	E420	0.384 mg/L	0.4 mg/L	96.0	70.0	130	
		potassium, total	7440-09-7	E420	38.3 mg/L	40 mg/L	95.8	70.0	130	
		selenium, total	7782-49-2	E420	0.388 mg/L	0.4 mg/L	97.0	70.0	130	
		silicon, total	7440-21-3	E420	102 mg/L	100 mg/L	102	70.0	130	
		silver, total	7440-22-4	E420	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	
		sodium, total	7440-23-5	E420	19.6 mg/L	20 mg/L	97.9	70.0	130	
		strontium, total	7440-24-6	E420	0.197 mg/L	0.2 mg/L	98.5	70.0	130	
		sulfur, total	7704-34-9	E420	174 mg/L	200 mg/L	87.0	70.0	130	
		thallium, total	7440-28-0	E420	0.0361 mg/L	0.04 mg/L	90.2	70.0	130	
		tin, total	7440-31-5	E420	0.184 mg/L	0.2 mg/L	91.9	70.0	130	
		titanium, total	7440-32-6	E420	0.378 mg/L	0.4 mg/L	94.4	70.0	130	
		uranium, total	7440-61-1	E420	0.0373 mg/L	0.04 mg/L	93.3	70.0	130	
		vanadium, total	7440-62-2	E420	0.954 mg/L	1 mg/L	95.4	70.0	130	
		zinc, total	7440-66-6	E420	3.84 mg/L	4 mg/L	95.9	70.0	130	
otal Metals (QC	CLot: 646084)									
G2212407-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.392 mg/L	0.4 mg/L	98.1	70.0	130	
otal Metals (QC	CLot: 647531)									
CG2212395-002	Anonymous	mercury, total	7439-97-6	E508	0.000103 mg/L	0.0001 mg/L	103	70.0	130	
issolved Metals	(QCLot: 646741)									
G2212207-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.451 mg/L	0.4 mg/L	113	70.0	130	

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 : CG2212409

 Client
 : Teck Coal Limited



Sub-Matrix: Water							Matrix Spik	e (MS) Report		
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	(QCLot: 646742)									
CG2212207-002	Anonymous	aluminum, dissolved	7429-90-5	E421	2.29 mg/L	2 mg/L	114	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.219 mg/L	0.2 mg/L	109	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.213 mg/L	0.2 mg/L	106	70.0	130	
		barium, dissolved	7440-39-3	E421	0.148 mg/L	0.2 mg/L	74.3	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.439 mg/L	0.4 mg/L	110	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.111 mg/L	0.1 mg/L	111	70.0	130	
		boron, dissolved	7440-42-8	E421	1.05 mg/L	1 mg/L	105	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.0445 mg/L	0.04 mg/L	111	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.216 mg/L	0.2 mg/L	108	70.0	130	
		copper, dissolved	7440-50-8	E421	0.220 mg/L	0.2 mg/L	110	70.0	130	
		iron, dissolved	7439-89-6	E421	21.2 mg/L	20 mg/L	106	70.0	130	
		lead, dissolved	7439-92-1	E421	0.225 mg/L	0.2 mg/L	112	70.0	130	
		lithium, dissolved	7439-93-2	E421	0.956 mg/L	1 mg/L	95.6	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.222 mg/L	0.2 mg/L	111	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.217 mg/L	0.2 mg/L	108	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.433 mg/L	0.4 mg/L	108	70.0	130	
		potassium, dissolved	7440-09-7	E421	40.9 mg/L	40 mg/L	102	70.0	130	
		selenium, dissolved	7782-49-2	E421	0.362 mg/L	0.4 mg/L	90.6	70.0	130	
		silicon, dissolved	7440-21-3	E421	82.1 mg/L	100 mg/L	82.1	70.0	130	
		silver, dissolved	7440-22-4	E421	0.0463 mg/L	0.04 mg/L	116	70.0	130	
		sodium, dissolved	7440-23-5	E421	20.3 mg/L	20 mg/L	101	70.0	130	
		strontium, dissolved	7440-24-6	E421	0.238 mg/L	0.2 mg/L	119	70.0	130	
		sulfur, dissolved	7704-34-9	E421	141 mg/L	200 mg/L	70.4	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.0425 mg/L	0.04 mg/L	106	70.0	130	
		tin, dissolved	7440-31-5	E421	0.222 mg/L	0.2 mg/L	111	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.451 mg/L	0.4 mg/L	113	70.0	130	
		uranium, dissolved	7440-61-1	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	
		vanadium, dissolved	7440-62-2	E421	1.08 mg/L	1 mg/L	108	70.0	130	
		zinc, dissolved	7440-66-6	E421	4.76 mg/L	4 mg/L	119	70.0	130	
issolved Metals	(QCLot: 647532)									
CG2212395-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000100 mg/L	0.0001 mg/L	100	70.0	130	

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 : CG2212409

 Client
 : Teck Coal Limited



Teck

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Facility Name / Job#		Program			Lab Name ALS Calgary Lab Contact Lyudmyla Shvets					Repor Email		Report Forma			Excel	PDF	EDD		
Project Manager					L		- -								SciLab@Teck.co	1	<u> X</u>	_ X	-
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Address	421 Pine Avenue					Address	2559 2	9 Str	reet NE				ail 3:	Teck.La	b.Results@teck	com X	X	X	-
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	Sparwood		Provin	e BC			Calgar			Province	AB	Ema	ail 5:	Awie	ebe@minnow.d	<u> </u>	X	X	
Postal Code	V0B 2G0		Countr	Canada	P	ostal Code	T1Y 7	35		Country	Canada	Ema	ail 6:	Giovan	na.Diaz@Teck		X	<u>x</u>	
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Environmental Division Calgary								RV. F										-	
Calgary Work Order Reference CG2212409	! 							PRESE	H2SO4	HCL	HCL				H2SO4			ļ <u> </u>	
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For Emergency <1 Day,	ASAP or Weekend	- Contact ALS	ــــــــــــــــــــــــــــــــــــــ									1	4 0 00	1	-		•		



Giovanna Diaz

CERTIFICATE OF ANALYSIS

Work Order : CG2212559

Client : Teck Coal Limited

Address : 421 Pine Avenue

. 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : --

Contact

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings/Minnow

Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 14-Sep-2022 17:41

Date Analysis Commenced : 15-Sep-2022

Issue Date : 19-Sep-2022 13:26

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Metals, Calgary, Alberta
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sara Niroomand		Metals, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

Page : 2 of 6 Work Order : CG2212559 Client

: Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
	Conductivity.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

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Work Order : CG2212559
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cl	lient sample ID	RG_GHBP_WS_ LAEMP_GC_20 22-09_N	RG_RIVER_WS _LAEMP_GC_2 022-09_N	 	
			Client samp	oling date / time	12-Sep-2022 07:44	12-Sep-2022 07:44	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212559-001	CG2212559-002	 	
					Result	Result	 	
Physical Tests		5000				0.0		
acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	 	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	238	234	 	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	290	285	 	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	7.6	10.6	 	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	4.6	6.4	 	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	246	244	 	
conductivity		E100	2.0	μS/cm	1540	1530	 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	994	1020	 	
oxidation-reduction potential [ORP]		E125	0.10	mV	314	314	 	
pH		E108	0.10	pH units	8.33	8.35	 	
solids, total dissolved [TDS]		E162	10	mg/L	1400	1400	 	
solids, total suspended [TSS]		E160-L	1.0	mg/L	2.2	1.7	 	
turbidity		E121	0.10	NTU	1.62	1.34	 	
Anions and Nutrients								
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0084	0.0080	 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	<0.250 DLDS	 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	1.85	1.71	 	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.147	0.143	 	
Kjeldahl nitrogen, total [TKN]	10904-40-0	E318	0.050	mg/L	1.67 TKNI	2.10 TKNI	 	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	4.34	4.45	 	
nitrite (as N)	14797-55-8	E235.NO3-L	0.0030		0.0102	0.0094	 	
		E378-U	0.0010	mg/L	<0.0010	<0.0094	 	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U E372-U		mg/L				
phosphorus, total	7723-14-0		0.0020	mg/L	0.0034	0.0043	 	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	780	797	 	
Organic / Inorganic Carbon		E350 !	0.50	n	4.00	4.00		
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.86	1.68	 	
carbon, total organic [TOC]		E355-L	0.50	mg/L	1.70	1.62	 	

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Work Order : CG2212559
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			Cli	ient sample ID	RG_GHBP_WS_	RG_RIVER_WS	 	
(Matrix: Water)					LAEMP_GC_20 22-09 N	_LAEMP_GC_2 022-09 N		
			Client samp	ling date / time	12-Sep-2022 07:44	12-Sep-2022 07:44	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212559-001	CG2212559-002	 	
					Result	Result	 	
Ion Balance		FC404	0.40		24.5	24.0		
anion sum		EC101	0.10	meq/L	21.5	21.8	 	
cation sum		EC101	0.10	meq/L	20.0	20.6	 	
ion balance (cations/anions)		EC101	0.010	%	93.0	94.5	 	
ion balance (APHA)		EC101	0.010	%	3.61	2.83	 	
Total Metals								
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0091	0.0081	 	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00047	0.00048	 	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00028	0.00029	 	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0422	0.0418	 	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	<0.020	 	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	 	
boron, total	7440-42-8	E420	0.010	mg/L	0.013	0.012	 	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0142	0.0098	 	
calcium, total	7440-70-2	E420	0.050	mg/L	157	156	 	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00016	0.00011	 	
cobalt, total	7440-48-4	E420	0.10	μg/L	<0.10	<0.10	 	
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	 	
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	 	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	 	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0197	0.0200	 	
magnesium, total	7439-95-4	E420	0.0050	mg/L	151	146	 	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00140	0.00137	 	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.000050	<0.000050	 	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00168	0.00168	 	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00862	0.00833	 	
potassium, total	7440-02-0	E420	0.050	mg/L	2.45	2.38	 	
selenium, total		E420	0.050	-	149	150	 	
·	7782-49-2	E420	0.050	μg/L mg/l	3.54	3.60		
silicon, total	7440-21-3			mg/L			 	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	 	
sodium, total	7440-23-5	E420	0.050	mg/L	2.72	2.66	 	

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Work Order : CG2212559
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			Cli	ient sample ID	RG_GHBP_WS_	RG_RIVER_WS	 	
(Matrix: Water)					LAEMP_GC_20	_LAEMP_GC_2		
					22-09_N	022-09_N		
			Client samp	ling date / time	12-Sep-2022 07:44	12-Sep-2022 07:44	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212559-001	CG2212559-002	 	
					Result	Result	 	
Total Metals strontium, total	7440-24-6	E420	0.00020	ma/l	0.188	0.193	 	
sulfur, total		E420	0.50	mg/L mg/L	276	280	 	
thallium, total	7704-34-9 7440-28-0	E420	0.000010	mg/L	0.000024	<0.00010	 	
tin, total		E420	0.00010	-	<0.00010	<0.00010	 	
titanium, total	7440-31-5	E420	0.00010	mg/L	0.00016	<0.00010	 	
·	7440-32-6	E420	0.00030	mg/L	0.00036	0.00871		
uranium, total	7440-61-1			mg/L	0.00051	<0.00671	 	
vanadium, total	7440-62-2	E420	0.00050	mg/L			 	
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0079	<0.0030	 	
Dissolved Metals	7400.00.5	E404	0.0010	a. //	<0.0010	<0.0010		
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	 	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00042	0.00046	 	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00023	0.00021	 	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0427	0.0423	 	
beryllium, dissolved	7440-41-7	E421	0.020	μg/L 	<0.020	<0.020	 	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	 	
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	 	
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	0.0089	0.0096	 	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	141	155	 	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	 	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.10	<0.10	 	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00042	0.00033	 	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	 	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	 	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0168	0.0187	 	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	156	154	 	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00090	0.00079	 	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	 	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00146	0.00164	 	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00804	0.00818	 	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.38	2.33	 	

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Work Order : CG2212559
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			CI	ient sample ID	RG_GHBP_WS_	RG_RIVER_WS	 	
(Matrix: Water)					LAEMP_GC_20 22-09_N	_LAEMP_GC_2 022-09_N		
			Client samp	ling date / time	12-Sep-2022 07:44	12-Sep-2022 07:44	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212559-001	CG2212559-002	 	
					Result	Result	 	
Dissolved Metals								
selenium, dissolved	7782-49-2	E421	0.050	μg/L	163	168	 	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.31	3.28	 	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	 	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.55	2.54	 	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.171	0.191	 	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	295	289	 	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	 	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	 	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	 	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00732	0.00696	 	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	 	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0010	<0.0010	 	
dissolved mercury filtration location		EP509	-	-	Field	Field	 	
dissolved metals filtration location		EP421	-	-	Field	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2212559** Page : 1 of 15

Client : **Teck Coal Limited** Laboratory : Calgary - Environmental Contact : Giovanna Diaz : Lyudmyla Shvets

: 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5
Telephone : ---- Telephone : +1 403 407 1800

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 14-Sep-2022 17:41

 PO
 : VPO00816101
 Issue Date
 : 19-Sep-2022 13:27

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings/Minnow

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 2
No. of samples analysed : 2

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

Key

Address

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers: Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					Ev	aluation: 🗴 =	Holding time exce	edance ; 🔻	= Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	raction / Pre	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_GHBP_WS_LAEMP_GC_2022-09_N	E298	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence									1	
Amber glass total (sulfuric acid) RG_RIVER_WS_LAEMP_GC_2022-09_N	E298	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.Br-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.Br-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.CI-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.CI-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Le	vel 0.001									
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E378-U	12-Sep-2022	15-Sep-2022				15-Sep-2022	3 days	4 days	# EHT

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Client : Teck Coal Limited



latrix: Water						aluation: × =	Holding time exce			Holding T
Inalyte Group	Method	Sampling Date	Ex	traction / Pr					Analysis	
Container / Client Sample ID(s)			Preparation	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	7 Times Actual	Eval
nions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ult	ra Trace Level 0.001		Date	Nec	Actual			Nec	Actual	
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E378-U	12-Sep-2022	15-Sep-2022				15-Sep-2022	3 days	4 days	x EHT
nions and Nutrients : Fluoride in Water by IC										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.F	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	√
nions and Nutrients : Fluoride in Water by IC										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.F	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	4
nions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.NO3-L	12-Sep-2022	15-Sep-2022	3 days	4 days	* EHT	15-Sep-2022	3 days	0 days	~
nions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.NO3-L	12-Sep-2022	15-Sep-2022	3 days	4 days	* EHT	15-Sep-2022	3 days	0 days	✓
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.NO2-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	3 days	4 days	* EHT
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.NO2-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	3 days	4 days	* EHT
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E235.SO4	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	1
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E235.SO4	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	4 days	✓

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



 Matrix: Water
 Evaluation: x = Holding time exceedance; √ = Within Holding Time

 Analyte Group
 Method
 Sampling Date
 Extraction / Preparation
 Analysis

 Container / Client Sample ID(s)
 Preparation
 Holding Times
 Eval
 Analysis Date
 Holding Times
 Eval

Method	Sampling Date	Ext	raction / P	reparation			is		
		Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
		Date	Rec	Actual			Rec	Actual	
F318	12-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	4 days	✓
								, -	
E318	12-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	4 days	✓
E372-U	12-Sep-2022	15-Sep-2022				16-Sep-2022	28 days	4 days	✓
E372-U	12-Sep-2022	15-Sep-2022				16-Sep-2022	28 days	4 days	✓
E421.Cr-L	12-Sep-2022	16-Sep-2022				16-Sep-2022	180	4 days	✓
							days		
E421.Cr-L	12-Sep-2022	16-Sep-2022				16-Sep-2022	180	4 days	✓
							days		
F500	40.0 0000	40.0				40.0 0000	00.1		,
E509	12-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	4 days	✓
			I						
F500	10 00= 0000	16 Cor 0000				16 00- 0000	00 d	1 4	✓
E509	12-Sep-2022	16-Sep-2022				16-Sep-2022	∠8 days	4 days	∀
						I			
	40.0 0000	16-Sep-2022				16-Sep-2022	180	4 days	✓
E421	12-Sep-2022	Th-Sen-2022							
	E318	E318 12-Sep-2022 E318 12-Sep-2022 E372-U 12-Sep-2022 E421.Cr-L 12-Sep-2022 E421.Cr-L 12-Sep-2022	E318 12-Sep-2022 16-Sep-2022 E318 12-Sep-2022 16-Sep-2022 E372-U 12-Sep-2022 15-Sep-2022 E421.Cr-L 12-Sep-2022 16-Sep-2022 E421.Cr-L 12-Sep-2022 16-Sep-2022 E509 12-Sep-2022 16-Sep-2022	E318 12-Sep-2022 16-Sep-2022 E318 12-Sep-2022 16-Sep-2022 E372-U 12-Sep-2022 15-Sep-2022 E372-U 12-Sep-2022 15-Sep-2022 E421.Cr-L 12-Sep-2022 16-Sep-2022 E421.Cr-L 12-Sep-2022 16-Sep-2022 E509 12-Sep-2022 16-Sep-2022	Preparation Holding Times Rec Actual	Preparation Holding Times Rec Actual	Preparation Date Holding Times Eval Analysis Date Rec Actual	E318 12-Sep-2022 16-Sep-2022 16-Sep-2022 28 days	E318 12-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 4 days

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

watrix: water						raidation.	Holding time exce	oudinoo ,	***************************************	riolanig riii
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation					
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_RIVER_WS_LAEMP_GC_2022-09_N	E421	12-Sep-2022	16-Sep-2022				16-Sep-2022	180	4 days	✓
								days		
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low	Level)									
Amber glass dissolved (sulfuric acid)										
RG_GHBP_WS_LAEMP_GC_2022-09_N	E358-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low	Level)									
Amber glass dissolved (sulfuric acid)										
RG_RIVER_WS_LAEMP_GC_2022-09_N	E358-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combu	ıstion (Low Level)									
Amber glass total (sulfuric acid)										
RG_GHBP_WS_LAEMP_GC_2022-09_N	E355-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combu	stion (Low Level)									
Amber glass total (sulfuric acid)										
RG_RIVER_WS_LAEMP_GC_2022-09_N	E355-L	12-Sep-2022	15-Sep-2022				15-Sep-2022	28 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_GHBP_WS_LAEMP_GC_2022-09_N	E283	12-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_RIVER_WS_LAEMP_GC_2022-09_N	E283	12-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GHBP_WS_LAEMP_GC_2022-09_N	E290	12-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration								1		
HDPE										
RG_RIVER_WS_LAEMP_GC_2022-09_N	E290	12-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	4 days	✓

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 Work Order
 : CG2212559

Client : Teck Coal Limited



Matrix: Water			_			aluation: × =	Holding time exce			Holding Ti
Analyte Group	Method	Sampling Date		traction / Pr				Analys		
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	7 Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E100	12-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E100	12-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	4 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E125	12-Sep-2022					16-Sep-2022	0.25 hrs	100 hrs	# EHTR-F
Physical Tests : ORP by Electrode										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E125	12-Sep-2022					16-Sep-2022	0.25 hrs	100 hrs	* EHTR-F
Physical Tests : pH by Meter										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E108	12-Sep-2022	16-Sep-2022				16-Sep-2022	0.25 hrs	0.25 hrs	# EHTR-I
Physical Tests : pH by Meter										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E108	12-Sep-2022	16-Sep-2022				16-Sep-2022	0.25 hrs	0.25 hrs	# EHTR-I
Physical Tests : TDS by Gravimetry										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E162	12-Sep-2022					15-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_RIVER_WS_LAEMP_GC_2022-09_N	E162	12-Sep-2022					15-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N	E160-L	12-Sep-2022					15-Sep-2022	7 days	4 days	✓

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 Work Order
 : CG2212559

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



✓

5 days

180 days

17-Sep-2022

Matrix: Water Evaluation: × = Holding time exceedance; ✓ = Within Holding Time Analyte Group Sampling Date Extraction / Preparation Analysis Method Container / Client Sample ID(s) **Holding Times** Eval Analysis Date **Holding Times** Eval Preparation Rec Actual Rec Actual Date Physical Tests: TSS by Gravimetry (Low Level) HDPE E160-L 7 days ✓ 12-Sep-2022 15-Sep-2022 RG_RIVER_WS_LAEMP_GC_2022-09_N 4 days **Physical Tests: Turbidity by Nephelometry** HDPE RG_GHBP_WS_LAEMP_GC_2022-09_N E121 12-Sep-2022 15-Sep-2022 3 days 4 days ----EHT **Physical Tests: Turbidity by Nephelometry** HDPE E121 RG_RIVER_WS_LAEMP_GC_2022-09_N 12-Sep-2022 15-Sep-2022 3 days 4 days 30 **EHT** Total Metals: Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) RG GHBP WS LAEMP GC 2022-09 N E420.Cr-L 12-Sep-2022 16-Sep-2022 17-Sep-2022 180 5 days ✓ days Total Metals: Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) E420.Cr-L 12-Sep-2022 ✓ RG_RIVER_WS_LAEMP_GC_2022-09_N 16-Sep-2022 17-Sep-2022 5 days 180 days **Total Metals: Total Mercury in Water by CVAAS** Glass vial total (hydrochloric acid) ✓ RG_GHBP_WS_LAEMP_GC_2022-09_N E508 12-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 4 days Total Metals: Total Mercury in Water by CVAAS Glass vial total (hydrochloric acid) RG_RIVER_WS_LAEMP_GC_2022-09_N E508 12-Sep-2022 ✓ 16-Sep-2022 16-Sep-2022 28 days | 4 days Total Metals: Total Metals in Water by CRC ICPMS HDPE - total (lab preserved) 16-Sep-2022 ✓ RG_GHBP_WS_LAEMP_GC_2022-09_N E420 12-Sep-2022 17-Sep-2022 5 days 180 days

12-Sep-2022

16-Sep-2022

E420

Legend & Qualifier Definitions

HDPE - total (lab preserved)

Total Metals: Total Metals in Water by CRC ICPMS

RG RIVER WS LAEMP GC 2022-09 N

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



EHT: Exceeded ALS recommended hold time prior to analysis.

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

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			C	ount)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	651335	1	15	6.6	5.0	1
Alkalinity Species by Titration	E290	651338	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	649577	1	17	5.8	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	649645	1	3	33.3	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	649646	1	6	16.6	5.0	1
Conductivity in Water	E100	651337	1	15	6.6	5.0	1
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	650493	1	4	25.0	5.0	1
Dissolved Mercury in Water by CVAAS	E509	650161	1	8	12.5	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	650494	1	4	25.0	5.0	1
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	649550	1	17	5.8	5.0	1
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	649627	2	26	7.6	5.0	1
Fluoride in Water by IC	E235.F	649644	1	6	16.6	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	649647	1	6	16.6	5.0	_
Nitrite in Water by IC (Low Level)	E235.NO2-L	649648	1	6	16.6	5.0	1
ORP by Electrode	E125	650422	1	10	10.0	5.0	1
pH by Meter	E108	651336	1	17	5.8	5.0	1
Sulfate in Water by IC	E235.SO4	649649	1	3	33.3	5.0	1
TDS by Gravimetry	E162	649536	1	16	6.2	5.0	1
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	650163	1	2	50.0	5.0	1
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	650197	1	6	16.6	5.0	1
Total Mercury in Water by CVAAS	E508	650165	1	6	16.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	650162	1	4	25.0	5.0	1
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	649551	1	18	5.5	5.0	1
Turbidity by Nephelometry	E121	649572	1	11	9.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	651335	1	15	6.6	5.0	1
Alkalinity Species by Titration	E290	651338	1	15	6.6	5.0	1
Ammonia by Fluorescence	E298	649577	1	17	5.8	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	649645	1	3	33.3	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	649646	1	6	16.6	5.0	1
Conductivity in Water	E100	651337	1	15	6.6	5.0	1
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	650493	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	650161	1	8	12.5	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	650494	1	4	25.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	649550	1	17	5.8	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	649627	2	26	7.6	5.0	✓
Fluoride in Water by IC	E235.F	649644	1	6	16.6	5.0	1

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Client : Teck Coal Limited



Matrix: Water		Evaluati	ion: × = QC freque	ency outside spe	ecification; ✓ =	QC frequency wi	thin specification
Quality Control Sample Type			Co	ount		Frequency (%)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Nitrate in Water by IC (Low Level)	E235.NO3-L	649647	1	6	16.6	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	649648	1	6	16.6	5.0	√
ORP by Electrode	E125	650422	1	10	10.0	5.0	1
pH by Meter	E108	651336	1	17	5.8	5.0	√
Sulfate in Water by IC	E235.SO4	649649	1	3	33.3	5.0	1
TDS by Gravimetry	E162	649536	1	16	6.2	5.0	√
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	650163	1	2	50.0	5.0	1
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	650197	1	6	16.6	5.0	1
Total Mercury in Water by CVAAS	E508	650165	1	6	16.6	5.0	√
Total Metals in Water by CRC ICPMS	E420	650162	1	4	25.0	5.0	1
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	649551	1	18	5.5	5.0	√
TSS by Gravimetry (Low Level)	E160-L	649523	1	12	8.3	5.0	1
Turbidity by Nephelometry	E121	649572	1	11	9.0	5.0	1
Method Blanks (MB)							
Acidity by Titration	E283	651335	1	15	6.6	5.0	1
Alkalinity Species by Titration	E290	651338	1	15	6.6	5.0	1
Ammonia by Fluorescence	E298	649577	1	17	5.8	5.0	√
Bromide in Water by IC (Low Level)	E235.Br-L	649645	1	3	33.3	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	649646	1	6	16.6	5.0	1
Conductivity in Water	E100	651337	1	15	6.6	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	650493	1	4	25.0	5.0	1
Dissolved Mercury in Water by CVAAS	E509	650161	1	8	12.5	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	650494	1	4	25.0	5.0	1
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	649550	1	17	5.8	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	649627	2	26	7.6	5.0	1
Fluoride in Water by IC	E235.F	649644	1	6	16.6	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	649647	1	6	16.6	5.0	√
Nitrite in Water by IC (Low Level)	E235.NO2-L	649648	1	6	16.6	5.0	1
Sulfate in Water by IC	E235.SO4	649649	1	3	33.3	5.0	1
TDS by Gravimetry	E162	649536	1	16	6.2	5.0	1
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	650163	1	2	50.0	5.0	1
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	650197	1	6	16.6	5.0	√
Total Mercury in Water by CVAAS	E508	650165	1	6	16.6	5.0	1
Total Metals in Water by CRC ICPMS	E420	650162	1	4	25.0	5.0	√
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	649551	1	18	5.5	5.0	√
TSS by Gravimetry (Low Level)	E160-L	649523	1	12	8.3	5.0	1
Turbidity by Nephelometry	E121	649572	1	11	9.0	5.0	√
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	649577	1	17	5.8	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	649645	1	3	33.3	5.0	1

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix: Water Evaluation: × = QC frequency outside specification, ✓ = QC frequency within specification.

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		Co	ount		Frequency (%)	
Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
E235.CI-L	649646	1	6	16.6	5.0	✓
E421.Cr-L	650493	1	4	25.0	5.0	✓
E509	650161	1	8	12.5	5.0	✓
E421	650494	1	4	25.0	5.0	✓
E358-L	649550	1	17	5.8	5.0	✓
E378-U	649627	2	26	7.6	5.0	✓
E235.F	649644	1	6	16.6	5.0	✓
E235.NO3-L	649647	1	6	16.6	5.0	✓
E235.NO2-L	649648	1	6	16.6	5.0	✓
E235.SO4	649649	1	3	33.3	5.0	✓
E420.Cr-L	650163	1	2	50.0	5.0	✓
E318	650197	1	6	16.6	5.0	✓
E508	650165	1	6	16.6	5.0	✓
E420	650162	1	4	25.0	5.0	✓
E355-L	649551	1	18	5.5	5.0	✓
	E235.CI-L E421.Cr-L E509 E421 E358-L E378-U E235.F E235.NO3-L E235.NO2-L E235.SO4 E420.Cr-L E318 E508 E420	E235.CI-L 649646 E421.Cr-L 650493 E509 650161 E421 650494 E358-L 649550 E378-U 649627 E235.F 649644 E235.NO3-L 649647 E235.SO4 649649 E420.Cr-L 650163 E318 650197 E508 650165 E420 650162	Method QC Lot # Cc E235.CI-L 649646 1 E421.Cr-L 650493 1 E509 650161 1 E421 650494 1 E358-L 649550 1 E378-U 649627 2 E235.F 649644 1 E235.NO3-L 649647 1 E235.NO2-L 649648 1 E235.SO4 649649 1 E420.Cr-L 650163 1 E318 650197 1 E508 650165 1 E420 650162 1	Method QC Lot # Count QC Regular E235.CI-L 649646 1 6 E421.Cr-L 650493 1 4 E509 650161 1 8 E421 650494 1 4 E358-L 649550 1 17 E378-U 649627 2 26 E235.F 649644 1 6 E235.NO3-L 649647 1 6 E235.NO2-L 649648 1 6 E235.SO4 649649 1 3 E420.Cr-L 650163 1 2 E318 650197 1 6 E508 650165 1 6 E420 650162 1 4	Method QC Lot # Count QC Regular Actual E235.CI-L 649646 1 6 16.6 E421.Cr-L 650493 1 4 25.0 E509 650161 1 8 12.5 E421 650494 1 4 25.0 E358-L 649550 1 17 5.8 E378-U 649627 2 26 7.6 E235.F 649644 1 6 16.6 E235.NO3-L 649647 1 6 16.6 E235.NO2-L 649648 1 6 16.6 E235.SO4 649649 1 3 33.3 E420.Cr-L 650163 1 2 50.0 E318 650197 1 6 16.6 E508 650165 1 6 16.6 E420 650162 1 4 25.0	Method QC Lot # Count QC Frequency (%) E235.Cl-L 649646 1 6 16.6 5.0 E421.Cr-L 650493 1 4 25.0 5.0 E509 650161 1 8 12.5 5.0 E421 650494 1 4 25.0 5.0 E358-L 649550 1 17 5.8 5.0 E378-U 649627 2 26 7.6 5.0 E235.F 649644 1 6 16.6 5.0 E235.NO3-L 649647 1 6 16.6 5.0 E235.NO2-L 649648 1 6 16.6 5.0 E235.SO4 649649 1 3 33.3 5.0 E318 650163 1 2 50.0 5.0 E318 650197 1 6 16.6 5.0 E508 650165 1 6 16.6 5.0

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Project : REGIONAL EFFECTS PROGRAM



Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water
	Calgary - Environmental			sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results,
	Calgary - Environmental			pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
	Calgary - Environmental			
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test
TSS by Cravimetry (Levy Level)	0 7	Water	APHA 2540 D (mod)	results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	vvalei	AFHA 2540 D (IIIOU)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
	Calgary - Environmental			filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis
				methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
, , ,			, ,	detection.
	Calgary - Environmental			
Chloride in Water by IC (Low Level)	E235.CI-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
Fluorida in Water by IC	Calgary - Environmental	Water	FDA 200.1 (mod)	
Fluoride in Water by IC	E235.F	vvaler	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and /or UV detection.
	Calgary - Environmental			detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
Canato in Water by 10	E233.3U4	vvator	21 / (000.1 (mod)	detection.
	Calgary - Environmental			account.
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Calgary - Environmental			

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Client : Teck Coal Limited



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Client : Teck Coal Limited



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCI.



QUALITY CONTROL REPORT

Work Order CG2212559

Client : Teck Coal Limited Contact : Giovanna Diaz Address

Sparwood BC Canada V0B2G0

421 Pine Avenue

Telephone

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number :REP LAEMP GC 2022-09 ALS

Sampler : Jennifer Ings/Minnow

Site

Quote number : Teck Coal Master Quote

No. of samples received No. of samples analysed : 2 Page : 1 of 18

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone :+1 403 407 1800

Date Samples Received :14-Sep-2022 17:41 **Date Analysis Commenced** :15-Sep-2022

: 19-Sep-2022 13:26 Issue Date

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

This Quality Control Report contains the following information:

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Calgary Metals, Calgary, Alberta
Millicent Brentnall	Laboratory Analyst	Calgary Metals, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Calgary Inorganics, Calgary, Alberta
Sara Niroomand		Calgary Inorganics, Calgary, Alberta
Sara Niroomand		Calgary Metals, Calgary, Alberta
Vladka Stamenova	Analyst	Calgary Inorganics, Calgary, Alberta

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 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Water							Labora	atory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC	C Lot: 649536)										
CG2212460-001	Anonymous	solids, total dissolved [TDS]		E162	20	mg/L	1540	1550	0.453%	20%	
Physical Tests (QC	C Lot: 649572)										
CG2212557-001	Anonymous	turbidity		E121	0.10	NTU	0.41	0.44	0.04	Diff <2x LOR	
Physical Tests (QC	C Lot: 650422)										
CG2212550-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	302	299	0.765%	15%	
Physical Tests (QC	C Lot: 651335)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	
Physical Tests (QC	C Lot: 651336)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	pH		E108	0.10	pH units	8.33	8.34	0.120%	4%	
Physical Tests (QC	C Lot: 651337)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	conductivity		E100	2.0	μS/cm	1540	1530	0.783%	10%	
Physical Tests (QC	C Lot: 651338)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	238	252	5.95%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	7.6	8.2	0.6	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	246	261	6.00%	20%	
Anions and Nutrien	nts (QC Lot: 649577)										
CG2212550-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	
Anions and Nutrien	nts (QC Lot: 649627)										
CG2212545-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
Anions and Nutrien	nts (QC Lot: 649628)										
CG2212559-002	RG_RIVER_WS_LAEMP_ GC_2022-09_N	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
Anions and Nutrien	nts (QC Lot: 649644)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	fluoride	16984-48-8	E235.F	0.100	mg/L	0.147	0.148	0.0007	Diff <2x LOR	
Anions and Nutrien	nts (QC Lot: 649645)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	
Anions and Nutrien	nts (QC Lot: 649646)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	chloride	16887-00-6	E235.CI-L	0.50	mg/L	1.85	1.84	0.003	Diff <2x LOR	

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Sub-Matrix: Water								tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
	ts (QC Lot: 649647)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	4.34	4.32	0.351%	20%	
Anions and Nutrien	ts (QC Lot: 649648)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.0102	0.0099	0.0003	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 649649)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	780	776	0.618%	20%	
Anions and Nutrien	ts (QC Lot: 650197)										
CG2212555-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.500	mg/L	2.23	2.12	0.109	Diff <2x LOR	
	Carbon (QC Lot: 64955	0)									
CG2212550-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 64955	1)									
CG2212550-001	Anonymous	carbon, total organic [TOC]		E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Total Metals (QC L	ot: 650162)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0091	0.0066	0.0025	Diff <2x LOR	
	12242240	antimony, total	7440-36-0	E420	0.00010	mg/L	0.00047	0.00046	0.000005	Diff <2x LOR	
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00028	0.00027	0.000010	Diff <2x LOR	
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0422	0.0427	1.25%	20%	
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, total	7440-42-8	E420	0.010	mg/L	0.013	0.012	0.0008	Diff <2x LOR	
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0142 µg/L	0.0000126	0.0000015	Diff <2x LOR	
		calcium, total	7440-70-2	E420	0.050	mg/L	157	154	2.20%	20%	
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0197	0.0190	4.00%	20%	
		magnesium, total	7439-95-4	E420	0.0050	mg/L	151	150	0.665%	20%	
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00140	0.00130	7.36%	20%	
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00168	0.00165	1.93%	20%	
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00862	0.00859	0.374%	20%	
		potassium, total	7440-09-7	E420	0.050	mg/L	2.45	2.40	2.33%	20%	
		selenium, total	7782-49-2	E420	0.000050	mg/L	149 µg/L	0.153	2.73%	20%	
		silicon, total	7440-21-3	E420	0.10	mg/L	3.54	3.56	0.642%	20%	
		511, 15161		1 =-	1	···g/ =		1.00			

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Sub-Matrix: Water						UP) Report	t				
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lo	ot: 650162) - continued										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		sodium, total	7440-23-5	E420	0.050	mg/L	2.72	2.73	0.235%	20%	
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.188	0.186	0.870%	20%	
		sulfur, total	7704-34-9	E420	0.50	mg/L	276	279	1.01%	20%	
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000024	<0.000010	0.000014	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00036	<0.00030	0.00006	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00864	0.00850	1.60%	20%	
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00051	<0.00050	0.000007	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0079	<0.0030	0.0049	Diff <2x LOR	
Total Metals (QC Lo	ot: 650163)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00016	0.00010	0.00006	Diff <2x LOR	
Total Metals (QC Lo	ot: 650165)										
CG2212559-001	RG_GHBP_WS_LAEMP_G C_2022-09_N	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (QC Lot: 650161)										
CG2212553-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (QC Lot: 650493)										
CG2212553-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00011	<0.00010	0.00001	Diff <2x LOR	
Dissolved Metals (QC Lot: 650494)										
CG2212553-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	0.00012	0.000008	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00018	0.00017	0.00001	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.128	0.123	4.45%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.015	0.015	0.0004	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0294 µg/L	0.0000220	0.0000074	Diff <2x LOR	
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	65.5	65.4	0.186%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0085	0.0087	0.0002	Diff <2x LOR	
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	24.7	24.3	1.38%	20%	
				1		-					

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Sub-Matrix: Water						Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier		
Dissolved Metals (QC Lot: 650494) - cor	ntinued											
CG2212553-001	Anonymous	manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00051	0.00047	0.00004	Diff <2x LOR			
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000784	0.000783	0.114%	20%			
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00115	0.00114	0.000006	Diff <2x LOR			
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.859	0.842	1.94%	20%			
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	2.37 μg/L	0.00245	3.08%	20%			
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.24	2.17	3.12%	20%			
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR			
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	5.89	5.77	1.96%	20%			
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.227	0.227	0.180%	20%			
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	45.1	44.6	1.19%	20%			
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR			
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR			
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR			
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000934	0.000945	1.25%	20%			
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR			
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR			

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Method Blank (MB) Report

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

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 649523)	7400				
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 649536)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Physical Tests (QCLot: 649572)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 651335)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 651337)					
conductivity	E100	1	μS/cm	1.0	
Physical Tests (QCLot: 651338)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Anions and Nutrients (QCLot: 649577)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 649627)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 649628)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 649644)					
fluoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 649645)					
bromide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 649646)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 649647)			-		
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 649648)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
()			<u> </u>		
Anions and Nutrients (QCLot: 649649)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
, ,	14000-10-0	0.0	ilig/L	10.00	
Anions and Nutrients (QCLot: 650197)					

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 65019					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Organic / Inorganic Carbon (QCLot:					
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot:					
carbon, total organic [TOC]	E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 650162)					
aluminum, total	7429-90-5 E420	0.003	mg/L	<0.0030	
antimony, total	7440-36-0 E420	0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2 E420	0.0001	mg/L	<0.00010	
parium, total	7440-39-3 E420	0.0001	mg/L	<0.00010	
peryllium, total	7440-41-7	0.00002	mg/L	<0.000020	
pismuth, total	7440-69-9 E420	0.00005	mg/L	<0.000050	
poron, total	7440-42-8 E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9 E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2 E420	0.05	mg/L	<0.050	
obalt, total	7440-48-4 E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8 E420	0.0005	mg/L	<0.00050	
ron, total	7439-89-6 E420	0.01	mg/L	<0.010	
ead, total	7439-92-1 E420	0.00005	mg/L	<0.000050	
ithium, total	7439-93-2 E420	0.001	mg/L	<0.0010	
nagnesium, total	7439-95-4 E420	0.005	mg/L	<0.0050	
nanganese, total	7439-96-5 E420	0.0001	mg/L	<0.00010	
nolybdenum, total	7439-98-7 E420	0.00005	mg/L	<0.000050	
ickel, total	7440-02-0 E420	0.0005	mg/L	<0.00050	
potassium, total	7440-09-7 E420	0.05	mg/L	<0.050	
elenium, total	7782-49-2 E420	0.00005	mg/L	<0.000050	
ilicon, total	7440-21-3 E420	0.1	mg/L	<0.10	
silver, total	7440-22-4 E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5 E420	0.05	mg/L	<0.050	
trontium, total	7440-24-6 E420	0.0002	mg/L	<0.00020	
ulfur, total	7704-34-9 E420	0.5	mg/L	<0.50	
nallium, total	7440-28-0 E420	0.00001	mg/L	<0.000010	
in, total	7440-31-5 E420	0.0001	mg/L	<0.00010	
itanium, total	7440-32-6 E420	0.0003	mg/L	<0.00030	
uranium, total	7440-61-1 E420	0.00001	mg/L	<0.00010	
vanadium, total	7440-62-2 E420	0.0005	mg/L	<0.00050	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 650162) - continued					
zinc, total	7440-66-6 E420	0.003	mg/L	<0.0030	
Total Metals (QCLot: 650163)					
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 650165)					
mercury, total	7439-97-6 E508	0.000005	mg/L	<0.0000050	
Dissolved Metals (QCLot: 650161)					
mercury, dissolved	7439-97-6 E509	0.000005	mg/L	<0.0000050	
Dissolved Metals (QCLot: 650493)					
chromium, dissolved	7440-47-3 E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 650494)					
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	<0.00010	
barium, dissolved	7440-39-3 E421	0.0001	mg/L	<0.00010	
beryllium, dissolved	7440-41-7 E421	0.00002	mg/L	<0.000020	
bismuth, dissolved	7440-69-9 E421	0.00005	mg/L	<0.000050	
boron, dissolved	7440-42-8 E421	0.01	mg/L	<0.010	
cadmium, dissolved	7440-43-9 E421	0.000005	mg/L	<0.0000050	
calcium, dissolved	7440-70-2 E421	0.05	mg/L	<0.050	
cobalt, dissolved	7440-48-4 E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8 E421	0.0002	mg/L	<0.00020	
iron, dissolved	7439-89-6 E421	0.01	mg/L	<0.010	
lead, dissolved	7439-92-1 E421	0.00005	mg/L	<0.000050	
lithium, dissolved	7439-93-2 E421	0.001	mg/L	<0.0010	
magnesium, dissolved	7439-95-4 E421	0.005	mg/L	<0.0050	
manganese, dissolved	7439-96-5 E421	0.0001	mg/L	<0.00010	
molybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	<0.00050	
potassium, dissolved	7440-09-7 E421	0.05	mg/L	<0.050	
selenium, dissolved	7782-49-2 E421	0.00005	mg/L	<0.000050	
silicon, dissolved	7440-21-3 E421	0.05	mg/L	<0.050	
silver, dissolved	7440-22-4 E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5 E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9 E421	0.5	mg/L	<0.50	
thallium, dissolved	7440-28-0 E421	0.00001	mg/L	<0.000010	

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ALS

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier			
Dissolved Metals (QCLot: 650494) - continued									
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010				
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030				
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010				
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050				
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010				

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Client : Took Coal in

Client : Teck Coal Limited



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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water						Laboratory Con	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 649523)									
solids, total suspended [TSS]		E160-L	1	mg/L	150 mg/L	95.7	85.0	115	
Physical Tests (QCLot: 649536)									
solids, total dissolved [TDS]		E162	10	mg/L	1000 mg/L	95.0	85.0	115	
Physical Tests (QCLot: 649572)									
turbidity		E121	0.1	NTU	200 NTU	110	85.0	115	
Physical Tests (QCLot: 650422)									
oxidation-reduction potential [ORP]		E125		mV	220 mV	101	95.4	104	
Physical Tests (QCLot: 651335)									
acidity (as CaCO3)		E283	2	mg/L	50 mg/L	106	85.0	115	
Physical Tests (QCLot: 651336)									
рН		E108		pH units	7 pH units	101	98.6	101	
Physical Tests (QCLot: 651337)									
conductivity		E100	1	μS/cm	146.9 μS/cm	99.6	90.0	110	
Physical Tests (QCLot: 651338)									
alkalinity, total (as CaCO3)		E290	1	mg/L	500 mg/L	103	85.0	115	
Anions and Nutrients (QCLot: 649577) ammonia, total (as N)	7664-41-7	F208	0.005	mg/L	0.2 mg/L	99.2	85.0	115	
	7004-41-7	2200	0.000	mg/L	0.2 Hig/L	99.2	00.0	113	
Anions and Nutrients (QCLot: 649627) phosphate, ortho-, dissolved (as P)	14265-44-2	E378-II	0.001	mg/L	0.03 mg/L	102	80.0	120	
	14200 44 2	2010 0	0.001	g/L	0.03 Hg/L	102	00.0	120	
Anions and Nutrients (QCLot: 649628) phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	102	80.0	120	
					0.00 mg/L	102		· 	
Anions and Nutrients (QCLot: 649644)	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	
					g/ _	.02			
Anions and Nutrients (QCLot: 649645)	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	103	85.0	115	
Anions and Nutrients (QCLot: 649646)				-	J				
chloride	16887-00-6	E235.CI-L	0.1	mg/L	100 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 649647)				-					
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	
Anions and Nutrients (QCLot: 649648)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	
Anions and Nutrients (QCLot: 649649)									1
Amons and Nutrients (QCLOL 043043)									

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Sub-Matrix: Water				Laboratory Control Sample (LCS) Report					
				Spike	Recovery (%) Recovery Limits (%)				
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Anions and Nutrients (QCLot: 649649)	- continued								
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110		
Anions and Nutrients (QCLot: 650197)									
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	4 mg/L	108	75.0	125		
Organic / Inorganic Carbon (QCLot: 64	.9550)								
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	8.57 mg/L	90.6	80.0	120		
Organic / Inorganic Carbon (QCLot: 64	9551)								
carbon, total organic [TOC]	E355-L	0.5	mg/L	8.57 mg/L	97.1	80.0	120		
Total Metals (QCLot: 650162)							1		
aluminum, total	7429-90-5 E420	0.003	mg/L	2 mg/L	107	80.0	120		
antimony, total	7440-36-0 E420	0.0001	mg/L	1 mg/L	100	80.0	120		
arsenic, total	7440-38-2 E420	0.0001	mg/L	1 mg/L	100	80.0	120		
barium, total	7440-39-3 E420	0.0001	mg/L	0.25 mg/L	101	80.0	120		
beryllium, total	7440-41-7 E420	0.00002	mg/L	0.1 mg/L	102	80.0	120		
bismuth, total	7440-69-9 E420	0.00005	mg/L	1 mg/L	95.0	80.0	120		
boron, total	7440-42-8 E420	0.01	mg/L	1 mg/L	100	80.0	120		
cadmium, total	7440-43-9 E420	0.000005	mg/L	0.1 mg/L	97.0	80.0	120		
calcium, total	7440-70-2 E420	0.05	mg/L	50 mg/L	99.3	80.0	120		
cobalt, total	7440-48-4 E420	0.0001	mg/L	0.25 mg/L	98.7	80.0	120		
copper, total	7440-50-8 E420	0.0005	mg/L	0.25 mg/L	96.4	80.0	120		
iron, total	7439-89-6 E420	0.01	mg/L	1 mg/L	106	80.0	120		
lead, total	7439-92-1 E420	0.00005	mg/L	0.5 mg/L	97.7	80.0	120		
lithium, total	7439-93-2 E420	0.001	mg/L	0.25 mg/L	107	80.0	120		
magnesium, total	7439-95-4 E420	0.005	mg/L	50 mg/L	100	80.0	120		
manganese, total	7439-96-5 E420	0.0001	mg/L	0.25 mg/L	101	80.0	120		
molybdenum, total	7439-98-7 E420	0.00005	mg/L	0.25 mg/L	103	80.0	120		
nickel, total	7440-02-0 E420	0.0005	mg/L	0.5 mg/L	96.9	80.0	120		
potassium, total	7440-09-7 E420	0.05	mg/L	50 mg/L	103	80.0	120		
selenium, total	7782-49-2 E420	0.00005	mg/L	1 mg/L	84.0	80.0	120		
silicon, total	7440-21-3 E420	0.1	mg/L	10 mg/L	115	60.0	140		
silver, total	7440-22-4 E420	0.00001	mg/L	0.1 mg/L	94.5	80.0	120		
sodium, total	7440-23-5 E420	0.05	mg/L	50 mg/L	101	80.0	120		
strontium, total	7440-24-6 E420	0.0002	mg/L	0.25 mg/L	102	80.0	120		
sulfur, total	7704-34-9 E420	0.5	mg/L	50 mg/L	107	80.0	120		
thallium, total	7440-28-0 E420	0.00001	mg/L	1 mg/L	96.1	80.0	120		
tin, total	7440-31-5 E420	0.0001	mg/L	0.5 mg/L	97.9	80.0	120		
in, wa		0.0001	∌, ⊏	0.5 mg/L	G. 10	55.6	.20		

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Sub-Matrix: Water			Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 650162) - continued									
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	105	80.0	120	
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.7	80.0	120	
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	96.4	80.0	120	
Total Metals (QCLot: 650163)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	98.7	80.0	120	
Total Metals (QCLot: 650165)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	94.5	80.0	120	
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	82.7	80.0	120	
Dissolved Metals (QCLot: 650493)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	94.5	80.0	120	
Dissolved Metals (QCLot: 650494)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	96.5	80.0	120	
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.2	80.0	120	
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.5	80.0	120	
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	97.2	80.0	120	
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	95.5	80.0	120	
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.1	80.0	120	
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.2	80.0	120	
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.1	80.0	120	
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	96.0	80.0	120	
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.4	80.0	120	
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.9	80.0	120	
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	99.0	80.0	120	
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	103	80.0	120	
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120	
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	96.8	80.0	120	
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	96.5	80.0	120	
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	92.8	80.0	120	
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.6	60.0	140	
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	95.2	80.0	120	
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	97.1	80.0	120	
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.6	80.0	120	

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Sub-Matrix: Water	p-Matrix: Water							Laboratory Control Sample (LCS) Report						
	Spike	Recovery (%)	Recovery Limits (%)											
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier					
Dissolved Metals (QCLot: 650494) - contin	ued													
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	101	80.0	120						
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.9	80.0	120						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.8	80.0	120						
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	99.6	80.0	120						
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	96.0	80.0	120						
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.8	80.0	120						
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.3	80.0	120						

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 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

Sub-Matrix: Water					Matrix Spike (MS) Report							
					Spi	ke	Recovery (%)	Recovery	Limits (%)			
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier		
	ents (QCLot: 649577)											
CG2212550-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.102 mg/L	0.1 mg/L	102	75.0	125			
Anions and Nutri	ents (QCLot: 649627)											
CG2212545-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0468 mg/L	0.05 mg/L	93.6	70.0	130			
Anions and Nutri	ents (QCLot: 649628)											
CG2212560-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0470 mg/L	0.05 mg/L	93.9	70.0	130			
Anions and Nutri	ents (QCLot: 649644)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	fluoride	16984-48-8	E235.F	0.889 mg/L	1 mg/L	88.9	75.0	125			
Anions and Nutri	ents (QCLot: 649645)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	bromide	24959-67-9	E235.Br-L	0.488 mg/L	0.5 mg/L	97.7	75.0	125			
Anions and Nutri	ents (QCLot: 649646)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	chloride	16887-00-6	E235.CI-L	101 mg/L	100 mg/L	101	75.0	125			
Anions and Nutri	ents (QCLot: 649647)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125			
Anions and Nutri	ents (QCLot: 649648)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	nitrite (as N)	14797-65-0	E235.NO2-L	0.510 mg/L	0.5 mg/L	102	75.0	125			
Anions and Nutri	ents (QCLot: 649649)											
CG2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125			
Anions and Nutri	ents (QCLot: 650197)											
CG2212555-002	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	ND mg/L	2.5 mg/L	ND	70.0	130			
Organic / Inorgar	nic Carbon (QCLot: 649	550)										
CG2212550-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	5.18 mg/L	5 mg/L	104	70.0	130			
Organic / Inorgar	nic Carbon (QCLot: 649	551)										
CG2212550-001	Anonymous	carbon, total organic [TOC]		E355-L	5.41 mg/L	5 mg/L	108	70.0	130			
otal Metals (QC	Lot: 650162)											
CG2212559-002	RG_RIVER_WS_LAEMP_G	aluminum, total	7429-90-5	E420	2.12 mg/L	2 mg/L	106	70.0	130			
	C_2022-09_N	antimony, total	7440-36-0	E420	0.220 mg/L	0.2 mg/L	110	70.0	130			

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ub-Matrix: Water	: Water						Matrix Spik	e (MS) Report		
aboratory sample					Spi	ke	Recovery (%)	Recovery	Limits (%)	
.aboratory sample D	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie
	Lot: 650162) - continue	d								
CG2212559-002	RG_RIVER_WS_LAEMP_G	arsenic, total	7440-38-2	E420	0.213 mg/L	0.2 mg/L	106	70.0	130	
	C_2022-09_N	barium, total	7440-39-3	E420	0.220 mg/L	0.2 mg/L	110	70.0	130	
		beryllium, total	7440-41-7	E420	0.444 mg/L	0.4 mg/L	111	70.0	130	
		bismuth, total	7440-69-9	E420	0.110 mg/L	0.1 mg/L	110	70.0	130	
		boron, total	7440-42-8	E420	1.18 mg/L	1 mg/L	118	70.0	130	
		cadmium, total	7440-43-9	E420	0.0474 mg/L	0.04 mg/L	118	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.222 mg/L	0.2 mg/L	111	70.0	130	
		copper, total	7440-50-8	E420	0.220 mg/L	0.2 mg/L	110	70.0	130	
		iron, total	7439-89-6	E420	22.3 mg/L	20 mg/L	112	70.0	130	
		lead, total	7439-92-1	E420	0.227 mg/L	0.2 mg/L	113	70.0	130	
		lithium, total	7439-93-2	E420	1.12 mg/L	1 mg/L	112	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	0.219 mg/L	0.2 mg/L	110	70.0	130	
		molybdenum, total	7439-98-7	E420	0.224 mg/L	0.2 mg/L	112	70.0	130	
		nickel, total	7440-02-0	E420	0.439 mg/L	0.4 mg/L	110	70.0	130	
		potassium, total	7440-09-7	E420	42.9 mg/L	40 mg/L	107	70.0	130	
		selenium, total	7782-49-2	E420	0.457 mg/L	0.4 mg/L	114	70.0	130	
		silicon, total	7440-21-3	E420	104 mg/L	100 mg/L	104	70.0	130	
		silver, total	7440-22-4	E420	0.0467 mg/L	0.04 mg/L	117	70.0	130	
		sodium, total	7440-23-5	E420	21.8 mg/L	20 mg/L	109	70.0	130	
		strontium, total	7440-24-6	E420	0.228 mg/L	0.2 mg/L	114	70.0	130	
		sulfur, total	7704-34-9	E420	ND mg/L	200 mg/L	ND	70.0	130	
		thallium, total	7440-28-0	E420	0.0428 mg/L	0.04 mg/L	107	70.0	130	
		tin, total	7440-31-5	E420	0.222 mg/L	0.2 mg/L	111	70.0	130	
		titanium, total	7440-32-6	E420	0.436 mg/L	0.4 mg/L	109	70.0	130	
		uranium, total	7440-61-1	E420	0.0459 mg/L	0.04 mg/L	115	70.0	130	
		vanadium, total	7440-62-2	E420	1.09 mg/L	1 mg/L	109	70.0	130	
		zinc, total	7440-66-6	E420	4.37 mg/L	4 mg/L	109	70.0	130	
otal Metals (QC	Lot: 650163)									
G2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	chromium, total	7440-47-3	E420.Cr-L	0.441 mg/L	0.4 mg/L	110	70.0	130	
otal Metals (QC	Lot: 650165)									
G2212559-002	RG_RIVER_WS_LAEMP_G C_2022-09_N	mercury, total	7439-97-6	E508	0.0000947 mg/L	0.0001 mg/L	94.7	70.0	130	
issolved Metals	(QCLot: 650161)									
G2212553-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000100 mg/L	0.0001 mg/L	100	70.0	130	

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 Client
 : Teck Coal Limited



Sub-Matrix: Water						Matrix Spik	e (MS) Report			
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	(QCLot: 650493)									
CG2212553-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.384 mg/L	0.4 mg/L	95.9	70.0	130	
Dissolved Metals	(QCLot: 650494)									
CG2212553-002	Anonymous	aluminum, dissolved	7429-90-5	E421	1.77 mg/L	2 mg/L	88.6	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.205 mg/L	0.2 mg/L	102	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.195 mg/L	0.2 mg/L	97.3	70.0	130	
		barium, dissolved	7440-39-3	E421	0.189 mg/L	0.2 mg/L	94.7	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.362 mg/L	0.4 mg/L	90.5	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.0978 mg/L	0.1 mg/L	97.8	70.0	130	
		boron, dissolved	7440-42-8	E421	0.928 mg/L	1 mg/L	92.8	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.0391 mg/L	0.04 mg/L	97.7	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.200 mg/L	0.2 mg/L	99.8	70.0	130	
		copper, dissolved	7440-50-8	E421	0.196 mg/L	0.2 mg/L	97.8	70.0	130	
		iron, dissolved	7439-89-6	E421	17.8 mg/L	20 mg/L	88.9	70.0	130	
		lead, dissolved	7439-92-1	E421	0.195 mg/L	0.2 mg/L	97.6	70.0	130	
		lithium, dissolved	7439-93-2	E421	0.915 mg/L	1 mg/L	91.5	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.198 mg/L	0.2 mg/L	98.9	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.200 mg/L	0.2 mg/L	100	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.394 mg/L	0.4 mg/L	98.4	70.0	130	
		potassium, dissolved	7440-09-7	E421	38.1 mg/L	40 mg/L	95.2	70.0	130	
		selenium, dissolved	7782-49-2	E421	0.397 mg/L	0.4 mg/L	99.4	70.0	130	
		silicon, dissolved	7440-21-3	E421	92.3 mg/L	100 mg/L	92.3	70.0	130	
		silver, dissolved	7440-22-4	E421	0.0428 mg/L	0.04 mg/L	107	70.0	130	
		sodium, dissolved	7440-23-5	E421	18.4 mg/L	20 mg/L	92.2	70.0	130	
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, dissolved	7704-34-9	E421	163 mg/L	200 mg/L	81.5	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	
		tin, dissolved	7440-31-5	E421	0.192 mg/L	0.2 mg/L	96.0	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.396 mg/L	0.4 mg/L	98.9	70.0	130	
		uranium, dissolved	7440-61-1	E421	0.0387 mg/L	0.04 mg/L	96.8	70.0	130	
		vanadium, dissolved	7440-62-2	E421	0.980 mg/L	1 mg/L	98.0	70.0	130	
		zinc, dissolved	7440-66-6	E421	4.12 mg/L	4 mg/L	103	70.0	130	

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 Work Order
 : CG2212559

 Client
 : Teck Coal Limited



Sample ID

RG_GHBP_WS_LAEMP_GC_2022-09_N

RG_RIVER_WS_LAEMP_GC_2022-09_N

For Emergency <1 Day, ASAP or Weekend - Contact ALS

REP LAEMP GC 2022-09 ALS TURNAROUND TIME: COC ID: RUSH: Priorty 2-3 Business Days LABORATORY OTHER INFO PROJECT/CLIENT INFO Lab Name ALS Calgary Facility Name / Job# Regional Effects Program Excel PDF EDD Report Format / Distribution Lab Contact Lyudmyla Shvets Project Manager Giovanna Diaz AquaSciLab@Teck.com Email Lyudmyla Shvets@ALSGlobal.com Email Giovanna.Diaz@Teck.com Email 2: teckçoak@equisonline.com Address 421 Pine Avenue Address 2559 29 Street NE Email 3: Teck Lab Results@teck.com X Email 4: Lisa.Bowron@minnow.ca City Sparwood Provinc BC City Calgary Email 5: Provinc AB Awiebe@minnow.ca Postal Code T1Y 7B5 Postal Code V0B 2G0 Country Canada Country Canada Email 6: Giovanna.Diaz@Teck.com X Phone Number 403 407 1794 Phone Number 1-250-865-3048 VPO00816101 PO number SAMPLE DETAILS ANALYSIS REQUESTED Filtered - F: Field, L: Lab, FL: Field & Lab, N: None ĕ Ν H2SO4 HCL HCL H2SO4 Hazardous Material (Yes/No) FECKCOAL_METNIG_D FECKCOAL_METNHG FECKCOAL_ROUTINE Mercury_Dissolved Mercury_Total FOC_TKN_PT G=Grab Sample Location C=Com # Of Field Time **Environmental Division** (sys loc code) Matrix Cont. Date (24hr) Calgary
Work Order Reference
CG2212559 RG GHBP WS 2022/09/12 7:44 G 1 1 1 1 RG RIVER WS 2022/09/12 7:44 G 1 1 Ť 1 1 WS WS WS WS WS WS WS WS ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME ACCEPTED BY/AFFILIATION DATE/TIME Dissolved metals were field filtered and to be lab preserved Jennifer Ings/Minnow ############## Total metals to be lab preserved

SERVICE REQUEST (rush - subject to availability) Regular (default) 5195003444 Sampler's Name Jennifer Ings Priority (2-3 business days) - 50% surcharge X Emergency (1 Business Day) - 100% surcharge

Sampler's Signature

September 13, 2022

Date/Time



CERTIFICATE OF ANALYSIS

Work Order : CG2212624

Client : Teck Coal Limited

Giovanna Diaz Address

: 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone

Contact

Project : REGIONAL EFFECT PROGRAM

: VPO00816101

: REP_LAEMP_GC_2022-09_ALS C-O-C number

Sampler : Jennifer Ings/Minnow

Site

Quote number : Teck Coal Master Quote

No. of samples received : 1 No. of samples analysed : 1 Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800 **Date Samples Received** : 15-Sep-2022 08:50

Date Analysis Commenced : 16-Sep-2022

Issue Date : 17-Sep-2022 17:53

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Metals, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sara Niroomand		Metals, Calgary, Alberta
Sheida Aria	Lab Assistant	Metals, Calgary, Alberta

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 : 2 of 6

 Work Order
 : CG2212624

 Client
 : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Qualifiers

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTA	Analytical holding time was exceeded.

>: greater than.

Page : 3 of 6
Work Order : CG2212624
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water			C	lient sample ID	RG_GANF_WS_	 	
(Matrix: Water)					LAEMP_GC_20 22-09_N		
			Client samp	oling date / time	13-Sep-2022 09:25	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212624-001	 	
					Result	 	
Physical Tests acidity (as CaCO3)		E283	2.0	mg/L	<2.0	 	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	293	 	
alkalinity, bicarbonate (as HCO3)	74 50 0	E290	1.0	-	358	 	
, ,	71-52-3	E290	1.0	mg/L	9.0	 	
alkalinity, carbonate (as CaCO3)				mg/L			
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	5.4	 	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	 	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	302	 	
conductivity		E100	2.0	μS/cm	1300	 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	826	 	
oxidation-reduction potential [ORP]		E125	0.10	mV	322	 	
рН		E108	0.10	pH units	8.33	 	
solids, total dissolved [TDS]		E162	10	mg/L	1070	 	
solids, total suspended [TSS]		E160-L	1.0	mg/L	1.2	 	
turbidity		E121	0.10	NTU	0.30 HTA	 	
Anions and Nutrients							
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	2.26	 	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.386	 	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	<0.500 DLM	 	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.211	 	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS	 	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	 	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0046	 	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	576	 	
Organic / Inorganic Carbon							
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	0.97	 	
carbon, total organic [TOC]		E355-L	0.50	mg/L	1.20	 	

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Work Order : CG2212624
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_GANF_WS_ LAEMP_GC_20 22-09_N		 	
			Client samp	ling date / time	13-Sep-2022 09:25		 	
Analyte	CAS Number	Method	LOR	Unit	CG2212624-001 Result		 	
Ion Balance					Nesuit		 	
anion sum		EC101	0.10	meq/L	18.1		 	
cation sum		EC101	0.10	meq/L	16.8		 	
ion balance (cations/anions)		EC101	0.010	%	92.8		 	
ion balance (APHA)		EC101	0.010	%	3.72		 	
Total Metals								
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0070		 	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00013		 	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00025		 	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0698		 	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020		 	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050		 	
boron, total	7440-42-8	E420	0.010	mg/L	0.016		 	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0075		 	
calcium, total	7440-70-2	E420	0.050	mg/L	143		 	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00014		 	
cobalt, total	7440-48-4	E420	0.10	μg/L	<0.10		 	
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050		 	
iron, total	7439-89-6	E420	0.010	mg/L	<0.010		 	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050		 	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0339		 	
magnesium, total	7439-95-4	E420	0.0050	mg/L	112		 	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00094		 	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050		 	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00124		 	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00135		 	
potassium, total	7440-09-7	E420	0.050	mg/L	2.76		 	
selenium, total	7782-49-2	E420	0.050	μg/L	7.28		 	
silicon, total	7440-21-3	E420	0.10	mg/L	3.14		 	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010		 	
sodium, total	7440-23-5	E420	0.050	mg/L	4.65		 	

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Work Order : CG2212624
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ent sample ID	RG_GANF_WS_ LAEMP_GC_20 22-09_N	 	
			·	ling date / time	13-Sep-2022 09:25	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212624-001 Result	 	
Total Metals					Result	 	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.263	 	
sulfur, total	7704-34-9	E420	0.50	mg/L	200	 	
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	 	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	 	
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	 	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00357	 	
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00250 DLB	 	
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	 	
Dissolved Metals							
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	 	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	 	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00015	 	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0745	 	
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.020	 	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	 	
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.013	 	
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	0.0051	 	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	146	 	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00012	 	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.10	 	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	 	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	 	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	 	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0309	 	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	112	 	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00113	 	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	 	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00128	 	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00128	 	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.94	 	

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Work Order : CG2212624
Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Analytical Results

Client sampling date / time 13-Sep-2022 09-25	Sub-Matrix: Water			CI	lient sample ID	RG_GANF_WS_	 	
Client sampling date / time 13-Sep-2022	(Matrix: Water)					LAEMP_GC_20		
Analyte CAS Number Method LOR Unit CG2212624-001						22-09_N		
CAS Number Method LOR Unit CG2212624-001				Client samp	oling date / time	13-Sep-2022	 	
Result Selent						09:25		
Dissolved Metals Selenium, dissolved 7782-49-2 E421 0.050 µg/L 7.52	Analyte	CAS Number	Method	LOR	Unit	CG2212624-001	 	
selenium, dissolved 7782-49-2 E421 0.050 µg/L 7.52						Result	 	
silicon, dissolved 7440-21-3 E421 0.050 mg/L 4.04 silver, dissolved 7440-22-4 E421 0.000010 mg/L 4.000010 mg/L 4.000010 sodium, dissolved 7440-23-5 E421 0.050 mg/L 4.73 strontium, dissolved 7440-24-6 E421 0.00020 mg/L 0.266 sulfur, dissolved 7704-34-9 E421 0.50 mg/L 210 thallium, dissolved 7440-28-0 E421 0.00010 mg/L 4.000010 mg/L 4.000010 titanium, dissolved 7440-31-5 E421 0.00010 mg/L 4.000010 mg/L 4.000010 sulfur, dissolved 7440-32-6 E421 0.00010 mg/L 4.000010 mg/L 4.000010 sulfur, dissolved 7440-32-6 E421 0.00010 mg/L 4.000010 mg/L 4.000010 sulfur, dissolved 7440-66-1 E421 0.00010 mg/L 4.000010 mg/L 4.000010 sulfur, dissolved 7440-66-6 E421 0.000010 mg/L 4.000000 mg/L 4.000010 -	Dissolved Metals							
silver, dissolved 7440-22-4 E421 0.000010 mg/L <0.000010	selenium, dissolved	7782-49-2	E421	0.050	μg/L	7.52	 	
sodium, dissolved 7440-23-5 E421 0.050 mg/L 4.73	silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.04	 	
strontium, dissolved 7440-24-6 E421 0.00020 mg/L 0.266	silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	 	
sulfur, dissolved 7704-34-9 E421 0.50 mg/L 210 </th <th>sodium, dissolved</th> <th>7440-23-5</th> <th>E421</th> <th>0.050</th> <th>mg/L</th> <th>4.73</th> <th> </th> <th> </th>	sodium, dissolved	7440-23-5	E421	0.050	mg/L	4.73	 	
thallium, dissolved 7440-28-0 E421 0.000010 mg/L <0.000010	strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.266	 	
tin, dissolved 7440-31-5 E421 0.00010 mg/L <0.00010	sulfur, dissolved	7704-34-9	E421	0.50	mg/L	210	 	
titanium, dissolved 7440-32-6 E421 0.00030 mg/L <0.00030	thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	 	
uranium, dissolved 7440-61-1 E421 0.000010 mg/L 0.00360	tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	 	
vanadium, dissolved 7440-62-2 E421 0.00050 mg/L <0.00050	titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	 	
zinc, dissolved 7440-66-6 E421 0.0010 mg/L <0.0010 dissolved mercury filtration location EP509 Field	uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00360	 	
dissolved mercury filtration location EP509 Field	vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	 	
	zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	 	
dissolved metals filtration location EP421 Field	dissolved mercury filtration location		EP509	-	-	Field	 	
	dissolved metals filtration location		EP421	-	_	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

CG2212624 **Work Order** Page : 1 of 13

Client : Teck Coal Limited Laboratory : Calgary - Environmental Contact · Giovanna Diaz Account Manager : Lyudmyla Shvets

> Address : 2559 29th Street NE : 421 Pine Avenue Sparwood BC Canada V0B2G0

Calgary, Alberta Canada T1Y 7B5

Telephone Telephone : +1 403 407 1800 **Project** : REGIONAL EFFECT PROGRAM **Date Samples Received** : 15-Sep-2022 08:50 PO Issue Date : VPO00816101 : 17-Sep-2022 17:54

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings/Minnow

Site

Quote number : Teck Coal Master Quote

No. of samples received : 1 No. of samples analysed : 1

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

Key

Address

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers: Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

No Quality Control Sample Frequency Outliers occur.



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 : 3 of 13

 Work Order
 : CG2212624

Client : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: Water

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Total Metals	QC-MRG2-6516750		vanadium, total	7440-62-2	E420	0.00052 MB-LOR	0.0005 mg/L	Blank result exceeds
	01					mg/L		permitted value

Result Qualifiers

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.

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Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					Ev	aluation: 🗴 =	Holding time exce	edance ; 🕥	/ = Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_GANF_WS_LAEMP_GC_2022-09_N	E298	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)									1	
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E235.Br-L	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E235.CI-L	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Le	vel 0.001									
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E378-U	13-Sep-2022	16-Sep-2022				16-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E235.F	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)									'	
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E235.NO3-L	13-Sep-2022	16-Sep-2022	3 days	3 days	✓	16-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)									1	
HDPE RG_GANF_WS_LAEMP_GC_2022-09_N	E235.NO2-L	13-Sep-2022	16-Sep-2022				16-Sep-2022	3 days	3 days	✓

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Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

viatrix: water						alaation.	Holding time exce	oudinoo ,	***************************************	riolaling in
Analyte Group	Method	Sampling Date	Ex	traction / Pi	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E235.SO4	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E318	13-Sep-2022	17-Sep-2022				17-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E372-U	13-Sep-2022	16-Sep-2022				17-Sep-2022	28 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level										
HDPE - dissolved (lab preserved)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E421.Cr-L	13-Sep-2022	17-Sep-2022				17-Sep-2022	180	4 days	✓
								days		
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E509	13-Sep-2022	17-Sep-2022				17-Sep-2022	28 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E421	13-Sep-2022	17-Sep-2022				17-Sep-2022	180	4 days	✓
								days		
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Lov	v Level)									
Amber glass dissolved (sulfuric acid)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E358-L	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Com	bustion (Low Level)									
Amber glass total (sulfuric acid)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E355-L	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E283	13-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	3 days	✓

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Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

viaturx: water					LV	aluation. * -	Holding time exce	euance,	- *************************************	Tribiumg Til
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E290	13-Sep-2022	16-Sep-2022				16-Sep-2022	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
RG GANF WS LAEMP GC 2022-09 N	E100	13-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	3 days	1
									,-	
Physical Tests : ORP by Electrode										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E125	13-Sep-2022					16-Sep-2022	0.25	84 hrs	×
110_0/111 _VV0_E/1EWII _00_2022-00_11	2120	10 000 2022					10 000 2022	hrs	011110	EHTR-FM
								1113		
Physical Tests : pH by Meter				1			I	1	I	I
HDPE	F400	40 0 0000	40.0 2000				40 0 0000			
RG_GANF_WS_LAEMP_GC_2022-09_N	E108	13-Sep-2022	16-Sep-2022				16-Sep-2022	0.25	0.25	*
								hrs	hrs	EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E162	13-Sep-2022					16-Sep-2022	7 days	3 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E160-L	13-Sep-2022					16-Sep-2022	7 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_GANF_WS_LAEMP_GC_2022-09_N	E121	13-Sep-2022					16-Sep-2022	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE - total (lab preserved)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E420.Cr-L	13-Sep-2022	17-Sep-2022				17-Sep-2022	180	4 days	✓
			·				·	days		
Total Metals : Total Mercury in Water by CVAAS								.,,-		
Glass vial total (hydrochloric acid)										
Giass viai total (IIVUI OCIIIOTIC aciu)										
RG_GANF_WS_LAEMP_GC_2022-09_N	E508	13-Sep-2022	17-Sep-2022				17-Sep-2022	28 days	2 dave	✓

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Matrix: Water Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	Ext	raction / Pro	eparation			Analys	is	
Container / Client Sample ID(s)		, ,	Preparation	Holding	Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GANF_WS_LAEMP_GC_2022-09_N	E420	13-Sep-2022	17-Sep-2022				17-Sep-2022	180 days	4 days	✓

Legend & Qualifier Definitions

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

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			Co	ount)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	651426	1	17	5.8	5.0	1
Alkalinity Species by Titration	E290	651429	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	651485	1	17	5.8	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	651474	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	651475	1	20	5.0	5.0	✓
Conductivity in Water	E100	651428	1	17	5.8	5.0	1
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	652076	1	15	6.6	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	651966	1	18	5.5	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	652077	1	17	5.8	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651436	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651462	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	651473	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	651476	1	20	5.0	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	651477	1	20	5.0	5.0	✓
ORP by Electrode	E125	651554	1	17	5.8	5.0	✓
pH by Meter	E108	651427	1	17	5.8	5.0	1
Sulfate in Water by IC	E235.SO4	651478	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	651516	1	19	5.2	5.0	1
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	651675	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	651465	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	651965	1	16	6.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	651676	1	17	5.8	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651437	1	17	5.8	5.0	1
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	651459	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	651454	1	9	11.1	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	651426	1	17	5.8	5.0	1
Alkalinity Species by Titration	E290	651429	1	17	5.8	5.0	<u> </u>
Ammonia by Fluorescence	E298	651485	1	17	5.8	5.0	<u>√</u>
Bromide in Water by IC (Low Level)	E235.Br-L	651474	1	20	5.0	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	651475	1	20	5.0	5.0	<u>√</u>
Conductivity in Water	E100	651428	1	17	5.8	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	652076	1	15	6.6	5.0	<u>√</u>
Dissolved Mercury in Water by CVAAS	E509	651966	1	18	5.5	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	652077	1	17	5.8	5.0	√
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651436	1	15	6.6	5.0	<u>√</u>
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651462	1	17	5.8	5.0	1

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Total Phosphorus by Colourimetry (0.002 mg/L)

TSS by Gravimetry (Low Level)

Turbidity by Nephelometry

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Quality Control Sample Type			Co	ount)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued			·				
Fluoride in Water by IC	E235.F	651473	1	20	5.0	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	651476	1	20	5.0	5.0	
Nitrite in Water by IC (Low Level)	E235.NO2-L	651477	1	20	5.0	5.0	
ORP by Electrode	E125	651554	1	17	5.8	5.0	√
pH by Meter	E108	651427	1	17	5.8	5.0	
Sulfate in Water by IC	E235.SO4	651478	1	20	5.0	5.0	√
TDS by Gravimetry	E162	651516	1	19	5.2	5.0	
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	651675	1	17	5.8	5.0	<u>√</u>
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	651465	1	17	5.8	5.0	<u> </u>
Total Mercury in Water by CVAAS	E508	651965	1	16	6.2	5.0	<u> </u>
Total Metals in Water by CRC ICPMS	E420	651676	1	17	5.8	5.0	<u> </u>
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651437	1	17	5.8	5.0	<u> </u>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	651459	1	17	5.8	5.0	
TSS by Gravimetry (Low Level)	E160-L	651515	1	19	5.2	5.0	<u> </u>
Turbidity by Nephelometry	E121	651454	1	9	11.1	5.0	
Method Blanks (MB)							
Acidity by Titration	E283	651426	1	17	5.8	5.0	✓
Alkalinity Species by Titration	E290	651429	1	17	5.8	5.0	
Ammonia by Fluorescence	E298	651485	1	17	5.8	5.0	<u> </u>
Bromide in Water by IC (Low Level)	E235.Br-L	651474	1	20	5.0	5.0	<u> </u>
Chloride in Water by IC (Low Level)	E235.CI-L	651475	1	20	5.0	5.0	√
Conductivity in Water	E100	651428	1	17	5.8	5.0	<u> </u>
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	652076	1	15	6.6	5.0	<u> </u>
Dissolved Mercury in Water by CVAAS	E509	651966	1	18	5.5	5.0	<u> </u>
Dissolved Metals in Water by CRC ICPMS	E421	652077	1	17	5.8	5.0	<u> </u>
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651436	1	15	6.6	5.0	<u> </u>
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651462	1	17	5.8	5.0	<u> </u>
Fluoride in Water by IC	E235.F	651473	1	20	5.0	5.0	<u> </u>
Nitrate in Water by IC (Low Level)	E235.NO3-L	651476	1	20	5.0	5.0	<u> </u>
Nitrite in Water by IC (Low Level)	E235.NO2-L	651477	1	20	5.0	5.0	
Sulfate in Water by IC	E235.SO4	651478	1	20	5.0	5.0	<u> </u>
TDS by Gravimetry	E162	651516	1	19	5.2	5.0	<u> </u>
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	651675	1	17	5.8	5.0	<u> </u>
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	651465	1	17	5.8	5.0	<u> </u>
Total Mercury in Water by CVAAS	E508	651965	1	16	6.2	5.0	
Total Metals in Water by CRC ICPMS	E420	651676	1	17	5.8	5.0	<u> </u>
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651437	1	17	5.8	5.0	<u> </u>
T-1-1 D11 1 - O-1 1 (0.000 11)	2000 2	051150	4	4-	5.0		

E372-U

E160-L

E121

651459

651515

651454

17

19

9

1

5.8

5.2

11.1

5.0

5.0

5.0

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

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Quality Control Sample Type			Count			Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS)								
Ammonia by Fluorescence	E298	651485	1	17	5.8	5.0	✓	
Bromide in Water by IC (Low Level)	E235.Br-L	651474	1	20	5.0	5.0	✓	
Chloride in Water by IC (Low Level)	E235.CI-L	651475	1	20	5.0	5.0	✓	
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	652076	1	15	6.6	5.0	✓	
Dissolved Mercury in Water by CVAAS	E509	651966	1	18	5.5	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	652077	1	17	5.8	5.0	✓	
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651436	1	15	6.6	5.0	✓	
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651462	1	17	5.8	5.0	✓	
Fluoride in Water by IC	E235.F	651473	1	20	5.0	5.0	✓	
Nitrate in Water by IC (Low Level)	E235.NO3-L	651476	1	20	5.0	5.0	✓	
Nitrite in Water by IC (Low Level)	E235.NO2-L	651477	1	20	5.0	5.0	✓	
Sulfate in Water by IC	E235.SO4	651478	1	20	5.0	5.0	✓	
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	651675	1	17	5.8	5.0	✓	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	651465	1	17	5.8	5.0	✓	
Total Mercury in Water by CVAAS	E508	651965	1	16	6.2	5.0	✓	
Total Metals in Water by CRC ICPMS	E420	651676	1	17	5.8	5.0	✓	
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651437	1	17	5.8	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	651459	1	17	5.8	5.0	✓	

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water
	Calgary - Environmental			sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results,
	Calgary - Environmental			pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
	Calgary - Environmental			
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test
TSS by Cravimetry (Levy Level)	0 7	Water	APHA 2540 D (mod)	results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	vvalei	AFHA 2540 D (IIIOU)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
	Calgary - Environmental			filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis
				methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
, , ,			, ,	detection.
	Calgary - Environmental			
Chloride in Water by IC (Low Level)	E235.CI-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
Fluorida in Water by IC	Calgary - Environmental	Water	FDA 200.1 (mod)	
Fluoride in Water by IC	E235.F	vvaler	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and /or UV detection.
	Calgary - Environmental			detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
Canato in Water by 10	E233.3U4	vvator	21 / (000.1 (mod)	detection.
	Calgary - Environmental			account.
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Calgary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
lon Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	Calgary - Environmental EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCI.



QUALITY CONTROL REPORT

Work Order : CG2212624

Client : Teck Coal Limited
Contact : Giovanna Diaz

Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ---

Project : REGIONAL EFFECT PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings/Minnow

Site :--

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 15-Sep-2022 08:50

Date Analysis Commenced : 16-Sep-2022

: 10 OCP 2022

Issue Date : 17-Sep-2022 17:54

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

This Quality Control Report contains the following information:

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories Position		Laboratory Department
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Calgary Metals, Calgary, Alberta
Sara Niroomand		Calgary Inorganics, Calgary, Alberta
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 : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Project : REGIONAL EFFECT PROGRAM



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Physical Tests (QC	Lot: 651426)										
CG2212617-001	Anonymous	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	
Physical Tests (QC	Lot: 651427)										
CG2212617-001	Anonymous	pH		E108	0.10	pH units	8.25	8.25	0.00%	4%	
Physical Tests (QC	Lot: 651428)										
CG2212617-001	Anonymous	conductivity		E100	2.0	μS/cm	732	724	1.10%	10%	
Physical Tests (QC	Lot: 651429)										
CG2212617-001	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	189	184	2.52%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	189	184	2.52%	20%	
Physical Tests (QC	Lot: 651454)										
CG2212624-001	RG_GANF_WS_LAEMP_G C 2022-09 N	turbidity		E121	0.10	NTU	0.30	0.32	0.02	Diff <2x LOR	
Physical Tests (QC	Lot: 651516)										
CG2212617-001	Anonymous	solids, total dissolved [TDS]		E162	20	mg/L	512	523	2.03%	20%	
Physical Tests (QC	Lot: 651554)							I			
CG2212617-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	315	318	0.854%	15%	
Anions and Nutrien	ts (QC Lot: 651459)										
CG2212617-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0050	0.0048	0.0001	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 651462)										
CG2212617-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 651465)										
CG2212617-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.500	mg/L	<0.500	<0.500	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 651473)										
CG2212617-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.192	0.195	0.003	Diff <2x LOR	
Anions and Nutrion	ts (QC Lot: 651474)					-					
CG2212617-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	
Anions and Nutrion	ts (QC Lot: 651475)					<u> </u>					
CG2212617-001	Anonymous	chloride	16887-00-6	E235.CI-L	0.10	mg/L	1.00	1.00	0.234%	20%	
	·					J. =					
Anions and Nutrien CG2212617-001	ts (QC Lot: 651476) Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.728	0.726	0.316%	20%	
JJ 12011 001		iniaio (as iv)	1-7.07-00-0		0.0000	g/∟	0.120	0.720	0.01070	2070	

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Sub-Matrix: Water	p-Matrix: Water				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Anions and Nutrien	ts (QC Lot: 651477)	- continued									
CG2212617-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0013	0.0013	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 651478)										
CG2212617-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	230	230	0.0432%	20%	
Anions and Nutrien	ts (QC Lot: 651485)										
CG2212617-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0058	0.0051	0.0007	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 651	1436)									
CG2212617-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 651	1437)									
CG2212617-001	Anonymous	carbon, total organic [TOC]		E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
Total Metals (QC L	ot: 651675)										
CG2212617-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00018	0.00016	0.00001	Diff <2x LOR	
Total Metals (QC L	ot: 651676)										
CG2212617-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0066	0.0066	0.00006	Diff <2x LOR	
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00017	0.00017	0.000005	Diff <2x LOR	
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00030	0.00032	0.00003	Diff <2x LOR	
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0803	0.0784	2.39%	20%	
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, total	7440-42-8	E420	0.010	mg/L	0.033	0.034	0.001	Diff <2x LOR	
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0226 µg/L	0.0000234	0.0000008	Diff <2x LOR	
		calcium, total	7440-70-2	E420	0.050	mg/L	87.9	88.1	0.204%	20%	
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.10 μg/L	<0.00010	0.000004	Diff <2x LOR	
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0156	0.0158	1.71%	20%	
		magnesium, total	7439-95-4	E420	0.0050	mg/L	37.8	36.6	3.10%	20%	
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00168	0.00167	0.701%	20%	
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000895	0.000886	1.04%	20%	
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00507	0.00491	0.00016	Diff <2x LOR	
		potassium, total	7440-09-7	E420	0.050	mg/L	1.18	1.15	2.05%	20%	
		selenium, total	7782-49-2	E420	0.000050	mg/L	5.06 μg/L	0.00527	4.15%	20%	
		silicon, total	7440-21-3	E420	0.10	mg/L	1.72	1.62	6.41%	20%	
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		sodium, total	7440-23-5	E420	0.050	mg/L	10.3	10.1	2.22%	20%	

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 : Teck Coal Limited



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lo	ot: 651676) - continue	d									
CG2212617-001	Anonymous	strontium, total	7440-24-6	E420	0.00020	mg/L	0.352	0.353	0.533%	20%	
		sulfur, total	7704-34-9	E420	0.50	mg/L	81.3	80.3	1.33%	20%	
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000020	0.000020	0.00000004	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00196	0.00202	3.16%	20%	
		vanadium, total	7440-62-2	E420	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	
Total Metals (QC Lo	ot: 651965)										
CG2212617-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (C	QC Lot: 651966)										
CG2212467-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Dissolved Metals (C	QC Lot: 652076)										
CG2212617-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00017	0.00015	0.00002	Diff <2x LOR	
Dissolved Metals (C	QC Lot: 652077)										
CG2212617-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0012	<0.0010	0.0002	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00017	0.00017	0.000006	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00024	0.00026	0.00001	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0877	0.0868	0.999%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.029	0.031	0.002	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0202 µg/L	0.0000195	0.0000006	Diff <2x LOR	
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	91.0	89.5	1.57%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.10 μg/L	0.00010	0.00000006	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0153	0.0155	1.53%	20%	
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	38.7	38.6	0.203%	20%	
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00191	0.00194	1.56%	20%	
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000953	0.000939	1.42%	20%	
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00503	0.00494	0.00009	Diff <2x LOR	
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.30	1.28	1.79%	20%	
		·				•	5.03 μg/L				

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Client : Teck Coal Limited



Sub-Matrix: Water	o-Matrix: Water				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 652077) - continued											
CG2212617-001	Anonymous	silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.11	2.10	0.595%	20%	
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	11.0	10.9	1.05%	20%	
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.364	0.368	1.28%	20%	
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	84.3	84.0	0.292%	20%	
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000021	0.000020	0.000001	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00204	0.00204	0.194%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	

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 Work Order
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 Client
 : Teck Coal Limited

Project : REGIONAL EFFECT PROGRAM



Method Blank (MB) Report

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

Sub-Matrix: Water

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 651426)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 651428)					
conductivity	E100	1	μS/cm	1.3	
Physical Tests (QCLot: 651429)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 651454)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 651515)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 651516)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 651459)					
phosphorus, total	7723-14-0 E372-U	0.002	mg/L	<0.0020	
Anions and Nutrients (QCLot: 651462)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 651465)					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 651473)					
fluoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 651474)					
bromide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 651475)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 651476)	AUZOZ SE O EGOS NOO I	0.007		10.0050	
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 651477)	44707 OF 0 F00F NOO!	0.004		10.0010	
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 651478)	44000 70 0 5005 00 5		_	.0.00	
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 651485)					

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Sub-Matrix: Water

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 651485)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Organic / Inorganic Carbon (QCLot: 65	1436)				
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot: 65	1437)				
carbon, total organic [TOC]	E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 651675)					
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 651676)					
aluminum, total	7429-90-5 E420	0.003	mg/L	<0.0030	
antimony, total	7440-36-0 E420	0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2 E420	0.0001	mg/L	<0.00010	
parium, total	7440-39-3 E420	0.0001	mg/L	<0.00010	
peryllium, total	7440-41-7 E420	0.00002	mg/L	<0.000020	
pismuth, total	7440-69-9 E420	0.00005	mg/L	<0.000050	
poron, total	7440-42-8 E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9 E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2 E420	0.05	mg/L	<0.050	
cobalt, total	7440-48-4 E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8 E420	0.0005	mg/L	<0.00050	
ron, total	7439-89-6 E420	0.01	mg/L	<0.010	
ead, total	7439-92-1 E420	0.00005	mg/L	<0.000050	
ithium, total	7439-93-2 E420	0.001	mg/L	<0.0010	
magnesium, total	7439-95-4 E420	0.005	mg/L	<0.0050	
manganese, total	7439-96-5 E420	0.0001	mg/L	<0.00010	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	<0.000050	
nickel, total	7440-02-0 E420	0.0005	mg/L	<0.00050	
potassium, total	7440-09-7 E420	0.05	mg/L	<0.050	
selenium, total	7782-49-2 E420	0.00005	mg/L	<0.000050	
silicon, total	7440-21-3 E420	0.1	mg/L	<0.10	
silver, total	7440-22-4 E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5 E420	0.05	mg/L	<0.050	
strontium, total	7440-24-6 E420	0.0002	mg/L	<0.00020	
sulfur, total	7704-34-9 E420	0.5	mg/L	<0.50	
thallium, total	7440-28-0 E420	0.00001	mg/L	<0.000010	
tin, total	7440-31-5 E420	0.0001	mg/L	<0.00010	
titanium, total	7440-32-6 E420	0.0003	mg/L	<0.00030	

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Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 651676) - con	tinued					
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	
vanadium, total	7440-62-2	E420	0.0005	mg/L	# 0.00052	MB-LOR
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	
Total Metals (QCLot: 651965)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	
Dissolved Metals (QCLot: 651966)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	
Dissolved Metals (QCLot: 652076)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 652077)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	
pismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	
poron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.000050	
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	
ron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	
ead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	
ithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	
ootassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	

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Sub-Matrix: Water

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 652077) - cont	inued				
tin, dissolved	7440-31-5 E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6 E421	0.0003	mg/L	<0.00030	
uranium, dissolved	7440-61-1 E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2 E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6 E421	0.001	mg/L	<0.0010	

Qualifiers

Qualifier Description

MB-LOR Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water				Laboratory Control Sample (LCS) Report					
				Spike	Recovery (%)	Recovery	Limits (%)		
Analyte CAS Nu	mber Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Physical Tests (QCLot: 651426)									
acidity (as CaCO3)	E283	2	mg/L	50 mg/L	106	85.0	115		
Physical Tests (QCLot: 651427)									
рН	E108		pH units	7 pH units	101	98.6	101		
Physical Tests (QCLot: 651428)									
conductivity	E100	1	μS/cm	146.9 μS/cm	100	90.0	110		
Physical Tests (QCLot: 651429)									
alkalinity, total (as CaCO3)	E290	1	mg/L	500 mg/L	103	85.0	115		
Physical Tests (QCLot: 651454)									
turbidity	E121	0.1	NTU	200 NTU	105	85.0	115		
Physical Tests (QCLot: 651515)									
solids, total suspended [TSS]	E160-L	1	mg/L	150 mg/L	93.9	85.0	115		
Physical Tests (QCLot: 651516)									
solids, total dissolved [TDS]	E162	10	mg/L	1000 mg/L	93.0	85.0	115		
Physical Tests (QCLot: 651554)									
oxidation-reduction potential [ORP]	E125		mV	220 mV	101	95.4	104		
Anions and Nutrients (QCLot: 651459)	44.0 5070 !!	0.000				00.0	400		
	-14-0 E372-U	0.002	mg/L	0.03 mg/L	103	80.0	120		
Anions and Nutrients (QCLot: 651462)	44.0 5070 11	0.004		2.22 "		00.0	400		
	-44-2 E378-U	0.001	mg/L	0.03 mg/L	93.9	80.0	120		
Anions and Nutrients (QCLot: 651465)	F240	0.05				75.0	405		
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	4 mg/L	104	75.0	125		
Anions and Nutrients (QCLot: 651473) fluoride 16984	-48-8 E235.F	0.02	ma/l		404	90.0	110		
	-40-0 E233.F	0.02	mg/L	1 mg/L	101	90.0	110		
Anions and Nutrients (QCLot: 651474) bromide 24958	-67-9 E235.Br-L	0.05	m a/l	0.5 #	100	85.0	115		
	-07-9 E235.BI-L	0.05	mg/L	0.5 mg/L	103	65.0	115		
Anions and Nutrients (QCLot: 651475)	-00-6 E235.CI-L	0.1	ma/l	400 mg/l	100	90.0	110		
	-00-0 L233.OI-L	0.1	mg/L	100 mg/L	100	90.0	110		
Anions and Nutrients (QCLot: 651476) nitrate (as N) 14797	-55-8 E235.NO3-L	0.005	mg/L	2.5 mg/l	101	90.0	110		
()	-00-0 L200.1400-L	0.000	IIIg/L	2.5 mg/L	101	30.0	110		
Anions and Nutrients (QCLot: 651477) nitrite (as N) 14797	-65-0 E235.NO2-L	0.001	mg/L	0.5 mg/L	99.7	90.0	110		
		0.001	IIIg/L	U.5 HIG/L	99.7	90.0	110		
Anions and Nutrients (QCLot: 651478)									

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Sub-Matrix: Water					Laboratory Co	ntrol Sample (LCS)	Report		
				Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Anions and Nutrients (QCLot: 651478) - conti	nued								
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110		
Anions and Nutrients (QCLot: 651485)									
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	0.2 mg/L	97.8	85.0	115		
Organic / Inorganic Carbon (QCLot: 651436)									
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	8.57 mg/L	95.4	80.0	120		
Organic / Inorganic Carbon (QCLot: 651437)									
carbon, total organic [TOC]	E355-L	0.5	mg/L	8.57 mg/L	96.8	80.0	120		
Total Metals (QCLot: 651675)									
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	0.25 mg/L	96.7	80.0	120		
Total Metals (QCLot: 651676)								1	
aluminum, total	7429-90-5 E420	0.003	mg/L	2 mg/L	100	80.0	120		
antimony, total	7440-36-0 E420	0.0001	mg/L	1 mg/L	97.1	80.0	120		
arsenic, total	7440-38-2 E420	0.0001	mg/L	1 mg/L	95.4	80.0	120		
barium, total	7440-39-3 E420	0.0001	mg/L	0.25 mg/L	98.0	80.0	120		
beryllium, total	7440-41-7 E420	0.00002	mg/L	0.1 mg/L	99.9	80.0	120		
bismuth, total	7440-69-9 E420	0.00005	mg/L	1 mg/L	91.2	80.0	120		
boron, total	7440-42-8 E420	0.01	mg/L	1 mg/L	99.7	80.0	120		
cadmium, total	7440-43-9 E420	0.000005	mg/L	0.1 mg/L	94.3	80.0	120		
calcium, total	7440-70-2 E420	0.05	mg/L	50 mg/L	92.1	80.0	120		
cobalt, total	7440-48-4 E420	0.0001	mg/L	0.25 mg/L	93.1	80.0	120		
copper, total	7440-50-8 E420	0.0005	mg/L	0.25 mg/L	92.9	80.0	120		
iron, total	7439-89-6 E420	0.01	mg/L	1 mg/L	106	80.0	120		
lead, total	7439-92-1 E420	0.00005	mg/L	0.5 mg/L	93.3	80.0	120		
lithium, total	7439-93-2 E420	0.001	mg/L	0.25 mg/L	108	80.0	120		
magnesium, total	7439-95-4 E420	0.005	mg/L	50 mg/L	96.7	80.0	120		
manganese, total	7439-96-5 E420	0.0001	mg/L	0.25 mg/L	99.8	80.0	120		
molybdenum, total	7439-98-7 E420	0.00005	mg/L	0.25 mg/L	96.2	80.0	120		
nickel, total	7440-02-0 E420	0.0005	mg/L	0.5 mg/L	94.0	80.0	120		
potassium, total	7440-09-7 E420	0.05	mg/L	50 mg/L	96.8	80.0	120		
selenium, total	7782-49-2 E420	0.00005	mg/L	1 mg/L	97.2	80.0	120		
silicon, total	7440-21-3 E420	0.1	mg/L	10 mg/L	89.3	60.0	140		
silver, total	7440-22-4 E420	0.00001	mg/L	0.1 mg/L	89.3	80.0	120		
sodium, total	7440-23-5 E420	0.05	mg/L	50 mg/L	95.8	80.0	120		
strontium, total	7440-24-6 E420	0.0002	mg/L	0.25 mg/L	98.4	80.0	120		
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Sub-Matrix: Water					Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifie		
Total Metals (QCLot: 651676) - con											
hallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	92.1	80.0	120			
in, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	96.3	80.0	120			
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.2	80.0	120			
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	94.3	80.0	120			
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	96.1	80.0	120			
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.8	80.0	120			
Total Metals (QCLot: 651965)											
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	101	80.0	120			
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.0	80.0	120			
Dissolved Metals (QCLot: 652076)											
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.0	80.0	120			
Dissolved Metals (QCLot: 652077)											
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120			
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	97.7	80.0	120			
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	95.8	80.0	120			
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	97.8	80.0	120			
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	103	80.0	120			
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	93.8	80.0	120			
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	104	80.0	120			
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	102	80.0	120			
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	94.7	80.0	120			
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.0	80.0	120			
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.3	80.0	120			
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	111	80.0	120			
ead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.8	80.0	120			
ithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	106	80.0	120			
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.4	80.0	120			
nanganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120			
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	100	80.0	120			
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.4	80.0	120			
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	96.6	80.0	120			
selenium, dissolved	7782-49-2		0.00005	mg/L	1 mg/L	92.8	80.0	120			
silicon, dissolved	7440-21-3		0.05	mg/L	10 mg/L	106	60.0	140			
silver, dissolved	7440-22-4		0.00001	mg/L	0.1 mg/L	94.2	80.0	120			
sodium, dissolved	7440-23-5		0.05	mg/L	50 mg/L	98.2	80.0	120			
strontium, dissolved	7440-24-6		0.0002	mg/L	0.25 mg/L	101	80.0	120			

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Sub-Matrix: Water	b-Matrix: Water						ontrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 652077) - cor	tinued								
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	92.8	80.0	120	
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	94.0	80.0	120	
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	99.0	80.0	120	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.7	80.0	120	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.3	80.0	120	

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Project : REGIONAL EFFECT PROGRAM

Matrix Spike (MS) Report

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

Sub-Matrix: Water							Matrix Spik	e (MS) Report		
					Spi	ke	Recovery (%)	Recovery Limits (%)		
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	ents (QCLot: 651459)								
CG2212617-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0531 mg/L	0.05 mg/L	106	70.0	130	
Anions and Nutri	ents (QCLot: 651462)								·
CG2212617-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0510 mg/L	0.05 mg/L	102	70.0	130	
Anions and Nutri	ents (QCLot: 651465	9)								
CG2212617-002	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.68 mg/L	2.5 mg/L	107	70.0	130	
Anions and Nutri	ents (QCLot: 651473)								
CG2212630-006	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 651474)								
CG2212630-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.516 mg/L	0.5 mg/L	103	75.0	125	
Anions and Nutri	ents (QCLot: 651475									
CG2212630-006	Anonymous	chloride	16887-00-6	E235.CI-L	99.7 mg/L	100 mg/L	99.7	75.0	125	
Anions and Nutri	ents (QCLot: 651476)								
CG2212630-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.50 mg/L	2.5 mg/L	100	75.0	125	
Anions and Nutri	ents (QCLot: 651477)								
CG2212630-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.508 mg/L	0.5 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 651478)								
CG2212630-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	
Anions and Nutri	ents (QCLot: 651485)								
CG2212617-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0997 mg/L	0.1 mg/L	99.7	75.0	125	
Organic / Inorgar	nic Carbon (QCLot: 6	51436)								
CG2212617-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	5.35 mg/L	5 mg/L	107	70.0	130	
Organic / Inorgar	nic Carbon (QCLot: 6	51437)								
CG2212617-001	Anonymous	carbon, total organic [TOC]		E355-L	5.65 mg/L	5 mg/L	113	70.0	130	
otal Metals (QC	Lot: 651675)									
CG2212617-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.402 mg/L	0.4 mg/L	100	70.0	130	
Total Metals (QC	Lot: 651676)									
CG2212617-002	Anonymous	aluminum, total	7429-90-5	E420	1.88 mg/L	2 mg/L	94.3	70.0	130	
	I	antimony, total	7440-36-0	E420	0.204 mg/L	0.2 mg/L	102	70.0	130	

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 Work Order
 : CG2212624

 Client
 : Teck Coal Limited



Sub-Matrix: Water							Matrix Spik	e (MS) Report		
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QC	Lot: 651676) - continu	ned								
CG2212617-002	Anonymous	arsenic, total	7440-38-2	E420	0.189 mg/L	0.2 mg/L	94.4	70.0	130	
		barium, total	7440-39-3	E420	0.187 mg/L	0.2 mg/L	93.3	70.0	130	
		beryllium, total	7440-41-7	E420	0.420 mg/L	0.4 mg/L	105	70.0	130	
		bismuth, total	7440-69-9	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	
		boron, total	7440-42-8	E420	1.13 mg/L	1 mg/L	113	70.0	130	
		cadmium, total	7440-43-9	E420	0.0413 mg/L	0.04 mg/L	103	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.199 mg/L	0.2 mg/L	99.6	70.0	130	
		copper, total	7440-50-8	E420	0.201 mg/L	0.2 mg/L	100	70.0	130	
		iron, total	7439-89-6	E420	20.4 mg/L	20 mg/L	102	70.0	130	
		lead, total	7439-92-1	E420	0.195 mg/L	0.2 mg/L	97.7	70.0	130	
		lithium, total	7439-93-2	E420	1.04 mg/L	1 mg/L	104	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	0.200 mg/L	0.2 mg/L	100	70.0	130	
		molybdenum, total	7439-98-7	E420	0.191 mg/L	0.2 mg/L	95.3	70.0	130	
		nickel, total	7440-02-0	E420	0.400 mg/L	0.4 mg/L	100	70.0	130	
		potassium, total	7440-09-7	E420	37.8 mg/L	40 mg/L	94.5	70.0	130	
		selenium, total	7782-49-2	E420	0.480 mg/L	0.4 mg/L	120	70.0	130	
		silicon, total	7440-21-3	E420	75.8 mg/L	100 mg/L	75.8	70.0	130	
		silver, total	7440-22-4	E420	0.0403 mg/L	0.04 mg/L	101	70.0	130	
		sodium, total	7440-23-5	E420	ND mg/L	20 mg/L	ND	70.0	130	
		strontium, total	7440-24-6	E420	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, total	7704-34-9	E420	151 mg/L	200 mg/L	75.7	70.0	130	
		thallium, total	7440-28-0	E420	0.0376 mg/L	0.04 mg/L	94.1	70.0	130	
		tin, total	7440-31-5	E420	0.204 mg/L	0.2 mg/L	102	70.0	130	
		titanium, total	7440-32-6	E420	0.386 mg/L	0.4 mg/L	96.4	70.0	130	
		uranium, total	7440-61-1	E420	0.0403 mg/L	0.04 mg/L	101	70.0	130	
		vanadium, total	7440-62-2	E420	0.970 mg/L	1 mg/L	97.0	70.0	130	
		zinc, total	7440-66-6	E420	4.02 mg/L	4 mg/L	100	70.0	130	
otal Metals (QC										
G2212617-002	Anonymous	mercury, total	7439-97-6	E508	0.0000968 mg/L	0.0001 mg/L	96.8	70.0	130	
issolved Metals	(QCLot: 651966)									
CG2212467-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000106 mg/L	0.0001 mg/L	106	70.0	130	
issolved Metals	(QCLot: 652076)									
CG2212617-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.378 mg/L	0.4 mg/L	94.4	70.0	130	

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 Client
 : Teck Coal Limited



Sub-Matrix: Water							Matrix Spik	re (MS) Report		
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	(QCLot: 652077)									
CG2212617-002	Anonymous	aluminum, dissolved	7429-90-5	E421	1.87 mg/L	2 mg/L	93.6	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.188 mg/L	0.2 mg/L	94.1	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.183 mg/L	0.2 mg/L	91.6	70.0	130	
		barium, dissolved	7440-39-3	E421	0.169 mg/L	0.2 mg/L	84.7	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.372 mg/L	0.4 mg/L	92.9	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.0930 mg/L	0.1 mg/L	93.0	70.0	130	
		boron, dissolved	7440-42-8	E421	0.978 mg/L	1 mg/L	97.8	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.192 mg/L	0.2 mg/L	95.8	70.0	130	
		copper, dissolved	7440-50-8	E421	0.191 mg/L	0.2 mg/L	95.4	70.0	130	
		iron, dissolved	7439-89-6	E421	18.9 mg/L	20 mg/L	94.4	70.0	130	
		lead, dissolved	7439-92-1	E421	0.189 mg/L	0.2 mg/L	94.4	70.0	130	
		lithium, dissolved	7439-93-2	E421	0.922 mg/L	1 mg/L	92.2	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.189 mg/L	0.2 mg/L	94.7	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.191 mg/L	0.2 mg/L	95.6	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.375 mg/L	0.4 mg/L	93.8	70.0	130	
		potassium, dissolved	7440-09-7	E421	36.6 mg/L	40 mg/L	91.5	70.0	130	
		selenium, dissolved	7782-49-2	E421	0.372 mg/L	0.4 mg/L	93.0	70.0	130	
		silicon, dissolved	7440-21-3	E421	93.6 mg/L	100 mg/L	93.6	70.0	130	
		silver, dissolved	7440-22-4	E421	0.0400 mg/L	0.04 mg/L	99.9	70.0	130	
		sodium, dissolved	7440-23-5	E421	ND mg/L	20 mg/L	ND	70.0	130	
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, dissolved	7704-34-9	E421	143 mg/L	200 mg/L	71.6	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.0363 mg/L	0.04 mg/L	90.9	70.0	130	
		tin, dissolved	7440-31-5	E421	0.188 mg/L	0.2 mg/L	94.1	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.378 mg/L	0.4 mg/L	94.6	70.0	130	
		uranium, dissolved	7440-61-1	E421	0.0379 mg/L	0.04 mg/L	94.8	70.0	130	
		vanadium, dissolved	7440-62-2	E421	0.935 mg/L	1 mg/L	93.5	70.0	130	
		zinc, dissolved	7440-66-6	E421	3.79 mg/L	4 mg/L	94.8	70.0	130	

RG_GANF_WS_LAEMP_GC_2022-09_N Dissolved metals were field filtered and to be lab preserved ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS SERVICE REQUEST (rush - subject to availability) Sample ID Priority (2-3 business days) - 50% surcharge X
Emergency (1 Business Day) - 100% surcharge
For Emergency <1 Day, ASAP or Weekend - Contact ALS Facility Name / Job# Regional Effects Program Total metals to be lab preserved Project Manager Giovanna Diaz Phone Number 1-250-865-3048 Postal Code V0B 2G0 Address 421 Pine Avenue Email Giovanna.Diaz@Teck.com PROJECT/CLIENT INFO Sample Location COC ID: (sys loc code) RG_GANF SAMPLE DETAILS REP_LAEMP_GC_2022-09_ALS | TURNAROUND TIME: Matrix Field WS Country Canada Proving BC Hazardous Material (Yes/No) Sampler's Signature RELINQUISHED BY/AFFILIATION Sampler's Name 2022/09/13 Jennifer Ings/Minnow (24hr) 9:25 Phone Number 403 407 1794 Postal Code T1Y 7B5 Lab Contact Lyudmyla Shvets C=Com Lab Name ALS Calgary Address 2559 29 Street NE ଦ Email Lyudmyla Shvets@ALSGlobal.com City Calgary Page Cont 7 e**r** Jennifer Ings ANALYSIS PRESERV. ############# LABORATORY: DATE/TIME ... H2S04 DOC -11 Country Canada Province AB TOTAL ANALYSIS REQUESTED Mercury_Dissolved Ŧ HCL z Mercury_Total ACCEPTED BY/AFFILIATION 5195003444 PO number Date/Time TECKCOAL_METNHG_D 7 Email 1: Email 4: Email 5: Email 6: Email 3: Email 2: Report Format / Distribution Z TECKCOAL_METNHG_T Giovanna.Diaz@Teck.com Teck Lab.Results@teck.com X z TECKCOAL_ROUTINE AguaSciLab@Teck.com isa.Bowron@minnow.ca Awiebe@minnow.ca H2SO4 TOC_TKN_PT Z RUSH: Priorty OTHER INFO VPO00816101 September 14, 2022 Telephane: +1 403 407 1800 Environmental Division filtered - F: Field, L: Lab, FL: Field & Lab, N: No Excel Mork Order Reference CG2212624 NTE/TIME PDF EDD

Environmental Division
Calgary
Work Order Reference
CG2212624



CERTIFICATE OF ANALYSIS

Work Order : CG2212661

Client : Teck Coal Limited

Contact : Giovanna Diaz

Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ---

Project : Regional Effects Program

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Samples Received : 16-Sep-2022 08:50

Date Analysis Commenced : 16-Sep-2022

Issue Date : 20-Sep-2022 19:16

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Metals, Calgary, Alberta
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Metals, Calgary, Alberta

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Qualifiers

Qualifier	Description
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
	noid time.

>: greater than.

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



Analytical Results

Sub-Matrix: Water			Ci	lient sample ID	RG_GAUT_WS_ LAEMP_GC_20	RG_FBLANK_W S_LAEMP_GC_	 	
(Matrix: Water)					22-09_N	2022-09_N		
			Client samp	oling date / time	14-Sep-2022 08:50	14-Sep-2022 08:50	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212661-001	CG2212661-002	 	
					Result	Result	 	
Physical Tests		E283	2.0	no a /I	<2.0	<2.0	 	
acidity (as CaCO3)				mg/L				
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	222	<1.0	 	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	271	<1.0	 	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	 	
alkalinity, total (as CaCO3)		E290	1.0	mg/L	222	<1.0	 	
conductivity		E100	2.0	μS/cm	466	<2.0	 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	243	<0.50	 	
oxidation-reduction potential [ORP]		E125	0.10	mV	276	510	 	
рН		E108	0.10	pH units	8.26	5.26	 	
solids, total dissolved [TDS]		E162	10	mg/L	292	<10	 	
solids, total suspended [TSS]		E160-L	1.0	mg/L	64.9	<1.0	 	
turbidity		E121	0.10	NTU	17.6	<0.10	 	
Anions and Nutrients								
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	2.46	<0.10	 	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.132	<0.020	 	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.097	<0.050	 	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0357	<0.0050 HTD	 	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	 	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0145	<0.0010	 	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0249	<0.0020	 	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	64.7	<0.30	 	
Organic / Inorganic Carbon								
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	2.77	<0.50	 	
carbon, total organic [TOC]		E355-L	0.50	mg/L	2.90	<0.50	 	

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



Analytical Results

Sub-Matrix: Water			Cli	ient sample ID	RG_GAUT_WS_	RG_FBLANK_W	 	
(Matrix: Water)					LAEMP_GC_20 22-09 N	S_LAEMP_GC_ 2022-09 N		
			Client samp	ling date / time	14-Sep-2022 08:50	14-Sep-2022 08:50	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212661-001	CG2212661-002	 	
					Result	Result	 	
Ion Balance		F0404	0.40		5.00	.0.40		
anion sum		EC101	0.10	meq/L	5.86	<0.10	 	
cation sum		EC101	0.10	meq/L	5.03	<0.10	 	
ion balance (cations/anions)		EC101	0.010	%	85.8	100	 	
ion balance (APHA)		EC101	0.010	%	7.62	<0.010	 	
Total Metals								
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0997	<0.0030	 	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00021	<0.00010	 	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00031	<0.00010	 	
barium, total	7440-39-3	E420	0.00010	mg/L	0.134	<0.00010	 	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	<0.020	 	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	 	
boron, total	7440-42-8	E420	0.010	mg/L	0.014	<0.010	 	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0279	<0.0050	 	
calcium, total	7440-70-2	E420	0.050	mg/L	72.4	<0.050	 	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00018	<0.00010	 	
cobalt, total	7440-48-4	E420	0.10	μg/L	0.17	<0.10	 	
copper, total	7440-50-8	E420	0.00050	mg/L	0.00051	<0.00050	 	
iron, total	7439-89-6	E420	0.010	mg/L	0.108	<0.010	 	
lead, total	7439-92-1	E420	0.000050	mg/L	0.000110	<0.000050	 	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0087	<0.0010	 	
magnesium, total	7439-95-4	E420	0.0050	mg/L	25.0	<0.0050	 	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00721	<0.00010	 	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.000050	<0.000050	 	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000879	<0.000050	 	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00217	<0.00050	 	
potassium, total	7440-02-0	E420	0.050	mg/L	1.35	<0.050	 	
selenium, total	7782-49-2	E420	0.050	-	0.856	<0.050	 	
silicon, total		E420	0.050	μg/L mg/l	4.20	<0.050	 	
·	7440-21-3			mg/L		<0.00010		
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010		 	
sodium, total	7440-23-5	E420	0.050	mg/L	3.65	<0.050	 	

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_GAUT_WS_ LAEMP_GC_20 22-09_N	RG_FBLANK_W S_LAEMP_GC_ 2022-09_N	 	
			Client sampl	ling date / time	14-Sep-2022 08:50	14-Sep-2022 08:50	 	
Analyte	CAS Number	Method	LOR	Unit	CG2212661-001	CG2212661-002	 	
					Result	Result	 	
Total Metals								
strontium, total	7440-24-6	E420	0.00020	mg/L	0.244	<0.00020	 	
sulfur, total	7704-34-9	E420	0.50	mg/L	25.4	<0.50	 	
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	 	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	 	
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00231	<0.00030	 	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000535	<0.000010	 	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00075	<0.00050	 	
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	 	
Dissolved Metals								
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0036	<0.0010	 	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00015	<0.00010	 	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00024	<0.00010	 	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.110	<0.00010	 	
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.020	<0.020	 	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	 	
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.010	<0.010	 	
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	0.0163	<0.0050	 	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	62.5	<0.050	 	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	 	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.10	<0.10	 	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00035	<0.00020	 	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	 	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	 	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0085	<0.0010	 	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	21.2	<0.0050	 	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00389	<0.00010	 	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.000050	<0.000050	 	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000734	<0.000050	 	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00168	<0.00050	 	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.16	<0.050	 	

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Project : Regional Effects Program



Analytical Results

Sub-Matrix: Water			CI	ient sample ID	RG_GAUT_WS_	RG_FBLANK_W	 	
(Matrix: Water)					LAEMP_GC_20 22-09 N	S_LAEMP_GC_		
					22-09_N	2022-09_N		
			Client samp	ling date / time	14-Sep-2022	14-Sep-2022	 	
					08:50	08:50		
Analyte	CAS Number	Method	LOR	Unit	CG2212661-001	CG2212661-002	 	
					Result	Result	 	
Dissolved Metals								
selenium, dissolved	7782-49-2	E421	0.050	μg/L	0.744	<0.050	 	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.58	<0.050	 	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	 	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	3.25	<0.050	 	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.223	<0.00020	 	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	21.6	<0.50	 	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	 	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	 	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	 	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000482	<0.000010	 	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	 	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0012	<0.0010	 	
dissolved mercury filtration location		EP509	-	-	Field	Field	 	
dissolved metals filtration location		EP421	-	-	Field	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2212661** Page : 1 of 15

Client: Teck Coal LimitedLaboratory: Calgary - EnvironmentalContact: Giovanna DiazAccount Manager: Lyudmyla Shvets

: 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0

Calgary, Alberta Canada T1Y 7B5

Telephone
:+1 403 407 1800

 Project
 : Regional Effects Program
 Date Samples Received
 : 16-Sep-2022 08:50

 PO
 : VPO00816101
 Issue Date
 : 20-Sep-2022 19:17

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 2
No. of samples analysed : 2

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

Key

Address

Telephone

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers: Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



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 Work Order
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Analysis Holding Time Compliance

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

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

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

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

Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time Matrix: Water Analyte Group Extraction / Preparation Method Sampling Date Container / Client Sample ID(s) **Holding Times** Eval Analysis Date Holding Times Eval Preparation Rec Actual Date Rec Actual Anions and Nutrients: Ammonia by Fluorescence Amber glass total (sulfuric acid) F298 14-Sep-2022 1 RG FBLANK WS LAEMP GC 2022-09 N 16-Sep-2022 16-Sep-2022 28 days 2 days Anions and Nutrients : Ammonia by Fluorescence Amber glass total (sulfuric acid) E298 14-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 2 days ✓ RG GAUT WS LAEMP GC 2022-09 N ----Anions and Nutrients: Bromide in Water by IC (Low Level) **HDPE** E235.Br-L 14-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 2 days RG FBLANK WS LAEMP GC 2022-09 N Anions and Nutrients: Bromide in Water by IC (Low Level) RG_GAUT_WS_LAEMP_GC_2022-09_N E235.Br-L 14-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 2 days Anions and Nutrients: Chloride in Water by IC (Low Level) HDPE RG FBLANK WS LAEMP GC 2022-09 N E235.CI-L 14-Sep-2022 16-Sep-2022 16-Sep-2022 28 days 2 days Anions and Nutrients: Chloride in Water by IC (Low Level) **HDPE** E235.CI-L 16-Sep-2022 14-Sep-2022 RG GAUT WS LAEMP GC 2022-09 N 16-Sep-2022 28 days 2 days Anions and Nutrients: Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 HDPE E378-U 14-Sep-2022 1 RG FBLANK WS LAEMP GC 2022-09 N 17-Sep-2022 17-Sep-2022 3 days 3 days

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Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

							Holding time exce			
nalyte Group	Method	Sampling Date	Ex	traction / Pr	eparation				sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual		,	Rec	Actual	
nions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Tra	ace Level 0.001									
HDPE										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E378-U	14-Sep-2022	17-Sep-2022				17-Sep-2022	3 days	3 days	✓
nions and Nutrients : Fluoride in Water by IC										
HDPE RG_FBLANK_WS_LAEMP_GC_2022-09_N	E235.F	14-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	2 days	~
nions and Nutrients : Fluoride in Water by IC										
HDPE	E235.F	14-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	2 days	1
RG_GAUT_WS_LAEMP_GC_2022-09_N	E233.F	14-Зер-2022	16-Sep-2022				16-Sep-2022	20 days	2 days	ľ
nions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_GAUT_WS_LAEMP_GC_2022-09_N	E235.NO3-L	14-Sep-2022	16-Sep-2022	3 days	2 days	✓	16-Sep-2022	3 days	0 days	✓
nions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_GC_2022-09_N	E235.NO3-L	14-Sep-2022	16-Sep-2022	3 days	2 days	✓	20-Sep-2022	3 days	4 days	×
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_GC_2022-09_N	E235.NO2-L	14-Sep-2022	16-Sep-2022				16-Sep-2022	3 days	2 days	✓
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE	F025 NO2 I	44.0 0000	40 0 0000				40 0 0000	2 -1	0 4	4
RG_GAUT_WS_LAEMP_GC_2022-09_N	E235.NO2-L	14-Sep-2022	16-Sep-2022				16-Sep-2022	3 days	2 days	
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_FBLANK_WS_LAEMP_GC_2022-09_N	E235.SO4	14-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	2 days	✓
nions and Nutrients : Sulfate in Water by IC									1	
HDPE										
RG GAUT WS LAEMP GC 2022-09 N	E235.SO4	14-Sep-2022	16-Sep-2022				16-Sep-2022	28 days	2 days	✓

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Matrix: Water

Evaluation:	v - Holding	time exceedance:	1-	Within Holding Time	

Matrix: Water					E۱	/aluation: 🗴 =	Holding time exce	edance ; 🔻	= Within	Holding 1
Analyte Group	Method	Sampling Date	Ex	traction / P	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
nions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E318	14-Sep-2022	18-Sep-2022				18-Sep-2022	28 days	4 days	✓
nions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E318	14-Sep-2022	18-Sep-2022				18-Sep-2022	28 days	4 days	✓
nions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)	E372-U	14 Can 2022	10 Con 2022				20-Sep-2022	20 days	6 days	1
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E372-U	14-Sep-2022	19-Sep-2022				20-Sep-2022	28 days	o days	•
nions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L) Amber glass total (sulfuric acid)							I			
RG_GAUT_WS_LAEMP_GC_2022-09_N	E372-U	14-Sep-2022	19-Sep-2022				20-Sep-2022	28 days	6 days	✓
110_0701_110_E71E1111	20.2 0	556 2522	.0 000 2022				20 000 2022	20 44,0	o unjo	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE - dissolved (lab preserved)										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E421.Cr-L	14-Sep-2022	19-Sep-2022				19-Sep-2022	180	5 days	✓
								days		
issolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE - dissolved (lab preserved)										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E421.Cr-L	14-Sep-2022	19-Sep-2022				19-Sep-2022	180	5 days	✓
								days		
issolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)	F500	44.0 0000						00.1		_
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E509	14-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	6 days	✓
bissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG GAUT WS LAEMP GC 2022-09 N	E509	14-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	6 days	✓
NO_0/10 /_NO_2/16/811 _00_2022 00_14	2000	. 1 GGP 2022							Jaays	*
bissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E421	14-Sep-2022	19-Sep-2022				19-Sep-2022	180	5 days	✓
_								days		

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Matrix: Water

Evaluation: **x** = Holding time exceedance : ✓ = Within Holding Time

Method	Sampling Date	Evi	traction / De						
	Cumping Date	LA	traction / Preparation			Analys		alysis	
		Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
		Date	Rec	Actual			Rec	Actual	
E421	14-Sep-2022	19-Sep-2022				19-Sep-2022	180 days	5 days	✓
vel)									
E358-L	14-Sep-2022	16-Sep-2022				17-Sep-2022	28 days	3 days	✓
vel)									
E358-L	14-Sep-2022	16-Sep-2022				17-Sep-2022	28 days	3 days	✓
ion (Low Level)									
E355-L	14-Sep-2022	16-Sep-2022				17-Sep-2022	28 days	3 days	✓
ion (Low Level)									
E355-L	14-Sep-2022	16-Sep-2022				17-Sep-2022	28 days	3 days	✓
E283	14-Sep-2022	17-Sep-2022				17-Sep-2022	14 days	3 days	✓
E283	14-Sep-2022	17-Sep-2022				17-Sep-2022	14 days	3 days	✓
E290	14-Sep-2022	17-Sep-2022				17-Sep-2022	14 days	3 days	✓
E290	14-Sep-2022	17-Sep-2022				17-Sep-2022	14 days	3 days	✓
	E358-L vel) E358-L ion (Low Level) E355-L ion (Low Level) E355-L	E358-L 14-Sep-2022 vel) E358-L 14-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 E283 14-Sep-2022	E421 14-Sep-2022 19-Sep-2022 vel) E358-L 14-Sep-2022 16-Sep-2022 vel) E358-L 14-Sep-2022 16-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 16-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 16-Sep-2022 E283 14-Sep-2022 17-Sep-2022	E421 14-Sep-2022 19-Sep-2022 Vel) E358-L 14-Sep-2022 16-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 16-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 16-Sep-2022 E283 14-Sep-2022 17-Sep-2022	E421 14-Sep-2022 19-Sep-2022 vel) E358-L 14-Sep-2022 16-Sep-2022 ion (Low Level) E355-L 14-Sep-2022 16-Sep-2022 E283 14-Sep-2022 17-Sep-2022 E283 14-Sep-2022 17-Sep-2022	E421 14-Sep-2022 19-Sep-2022 vel	E421 14-Sep-2022 19-Sep-2022 19-Sep-2022 19-Sep-2022 17-Sep-2022 E421 14-Sep-2022 19-Sep-2022 19-Sep-2022 180 days	E421 14-Sep-2022 19-Sep-2022 19-Sep-2022 180 days 5 days days 5 days days 17-Sep-2022 28 days 3 days 18-Sep-2022 16-Sep-2022 17-Sep-2022 28 days 3 days 18-Sep-2022 16-Sep-2022 17-Sep-2022 28 days 3 days 18-Sep-2022 16-Sep-2022 17-Sep-2022 28 days 3 days 18-Sep-2022 16-Sep-2022 17-Sep-2022 28 days 3 days 18-Sep-2022 16-Sep-2022 17-Sep-2022 28 days 3 days 18-Sep-2022 17-Sep-2022 18-Sep-2022 17-Sep-2022 18-Sep-2022 1	

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Project : Regional Effects Program



Matrix: **Water** Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time

Wattin. Water						aldation. • =	riolaling time exce	cuarioc , .	- vviciiii	i i ioiding Tili
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Conductivity in Water										
HDPE										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E100	14-Sep-2022	17-Sep-2022				17-Sep-2022	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E100	14-Sep-2022	17-Sep-2022				17-Sep-2022	28 days	3 days	✓
Physical Tests : ORP by Electrode										
HDPE										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E125	14-Sep-2022					17-Sep-2022	0.25	73 hrs	3 5
								hrs		EHTR-FM
Physical Tests : ORP by Electrode										
HDPE										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E125	14-Sep-2022					17-Sep-2022	0.25	73 hrs	*
								hrs		EHTR-FM
Physical Tests : pH by Meter										
HDPE										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E108	14-Sep-2022	17-Sep-2022				17-Sep-2022	0.25	0.25	*
								hrs	hrs	EHTR-FM
Physical Tests : pH by Meter										
HDPE										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E108	14-Sep-2022	17-Sep-2022				17-Sep-2022	0.25	0.25	*
								hrs	hrs	EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E162	14-Sep-2022					17-Sep-2022	7 days	3 days	✓
Physical Tests : TDS by Gravimetry										
HDPE										
RG_GAUT_WS_LAEMP_GC_2022-09_N	E162	14-Sep-2022					17-Sep-2022	7 days	3 days	✓
							·			
Physical Tests : TSS by Gravimetry (Low Level)									l .	l
HDPE [TSS-WB]										
RG_FBLANK_WS_LAEMP_GC_2022-09_N	E160-L	14-Sep-2022					17-Sep-2022	7 days	3 days	✓
							·			

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Matrix: Water					Ev	aluation: 🗴 =	Holding time exce	edance ; 🔻	= Within	Holding T
Analyte Group	Method	Sampling Date	Ext	traction / Pro	eparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding Rec	Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval
Physical Tests : TSS by Gravimetry (Low Level)			Date	Rec	Actual			Rec	Actual	
HDPE [TSS-WB] RG_GAUT_WS_LAEMP_GC_2022-09_N	E160-L	14-Sep-2022					17-Sep-2022	7 days	3 days	√
hysical Tests : Turbidity by Nephelometry										
HDPE RG_FBLANK_WS_LAEMP_GC_2022-09_N	E121	14-Sep-2022					16-Sep-2022	3 days	3 days	1
Physical Tests : Turbidity by Nephelometry										
HDPE RG_GAUT_WS_LAEMP_GC_2022-09_N	E121	14-Sep-2022					16-Sep-2022	3 days	3 days	√
otal Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE - total (lab preserved) RG_FBLANK_WS_LAEMP_GC_2022-09_N	E420.Cr-L	14-Sep-2022	18-Sep-2022				18-Sep-2022	180 days	4 days	✓
otal Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE - total (lab preserved) RG_GAUT_WS_LAEMP_GC_2022-09_N	E420.Cr-L	14-Sep-2022	18-Sep-2022				18-Sep-2022	180 days	4 days	~
otal Metals : Total Mercury in Water by CVAAS								,		
Glass vial total (hydrochloric acid) RG_FBLANK_WS_LAEMP_GC_2022-09_N	E508	14-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	6 days	✓
otal Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) RG_GAUT_WS_LAEMP_GC_2022-09_N	E508	14-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	6 days	1
otal Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_FBLANK_WS_LAEMP_GC_2022-09_N	E420	14-Sep-2022	18-Sep-2022				18-Sep-2022	180 days	4 days	✓
otal Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GAUT_WS_LAEMP_GC_2022-09_N	E420	14-Sep-2022	18-Sep-2022				18-Sep-2022	180 days	4 days	√

Legend & Qualifier Definitions

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

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 Client
 : Teck Coal Lie

Client : Teck Coal Limited
Project : Regional Effects Program



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

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 Project
 : Regional Effects Program



Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			Co	ount		Frequency (%))
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	652128	1	19	5.2	5.0	1
Alkalinity Species by Titration	E290	652131	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	651651	1	12	8.3	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	651629	1	11	9.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	651630	1	11	9.0	5.0	✓
Conductivity in Water	E100	652130	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	653366	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	655111	1	20	5.0	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	653367	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651624	1	6	16.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651928	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	651628	1	11	9.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	651631	1	11	9.0	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	651632	1	11	9.0	5.0	✓
ORP by Electrode	E125	652149	1	19	5.2	5.0	✓
pH by Meter	E108	652129	1	19	5.2	5.0	1
Sulfate in Water by IC	E235.SO4	651633	1	11	9.0	5.0	✓
TDS by Gravimetry	E162	652293	1	17	5.8	5.0	1
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	652278	1	15	6.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	652134	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	655100	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	652279	1	15	6.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651625	1	6	16.6	5.0	1
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	653712	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	651627	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	652128	1	19	5.2	5.0	1
Alkalinity Species by Titration	E290	652131	1	19	5.2	5.0	<u> </u>
Ammonia by Fluorescence	E298	651651	1	12	8.3	5.0	<u>√</u>
Bromide in Water by IC (Low Level)	E235.Br-L	651629	1	11	9.0	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	651630	1	11	9.0	5.0	<u>√</u>
Conductivity in Water	E100	652130	1	19	5.2	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	653366	1	18	5.5	5.0	<u>√</u>
Dissolved Mercury in Water by CVAAS	E509	655111	1	20	5.0	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	653367	1	19	5.2	5.0	√
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651624	1	6	16.6	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651928	1	20	5.0	5.0	1

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Matrix: Water

Evaluation: V	- 00	frequency o	utcida	specification:	/ - 00	frequency	within	cnecification

Quality Control Sample Type			Co	ount	Frequency (%)			
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Laboratory Control Samples (LCS) - Continued								
Fluoride in Water by IC	E235.F	651628	1	11	9.0	5.0	1	
Nitrate in Water by IC (Low Level)	E235.NO3-L	651631	1	11	9.0	5.0	√	
Nitrite in Water by IC (Low Level)	E235.NO2-L	651632	1	11	9.0	5.0	1	
ORP by Electrode	E125	652149	1	19	5.2	5.0	1	
pH by Meter	E108	652129	1	19	5.2	5.0	1	
Sulfate in Water by IC	E235.SO4	651633	1	11	9.0	5.0	1	
TDS by Gravimetry	E162	652293	1	17	5.8	5.0	✓	
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	652278	1	15	6.6	5.0	1	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	652134	1	20	5.0	5.0	✓	
Total Mercury in Water by CVAAS	E508	655100	1	19	5.2	5.0	1	
Total Metals in Water by CRC ICPMS	E420	652279	1	15	6.6	5.0	√	
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651625	1	6	16.6	5.0	√	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	653712	1	20	5.0	5.0	√	
TSS by Gravimetry (Low Level)	E160-L	652292	1	17	5.8	5.0	<u>√</u>	
Turbidity by Nephelometry	E121	651627	1	20	5.0	5.0	1	
Method Blanks (MB)								
Acidity by Titration	E283	652128	1	19	5.2	5.0	✓	
Alkalinity Species by Titration	E290	652131	1	19	5.2	5.0	1	
Ammonia by Fluorescence	E298	651651	1	12	8.3	5.0	1	
Bromide in Water by IC (Low Level)	E235.Br-L	651629	1	11	9.0	5.0	√	
Chloride in Water by IC (Low Level)	E235.CI-L	651630	1	11	9.0	5.0	1	
Conductivity in Water	E100	652130	1	19	5.2	5.0	√	
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	653366	1	18	5.5	5.0	1	
Dissolved Mercury in Water by CVAAS	E509	655111	1	20	5.0	5.0	1	
Dissolved Metals in Water by CRC ICPMS	E421	653367	1	19	5.2	5.0	√	
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	651624	1	6	16.6	5.0	1	
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	651928	1	20	5.0	5.0	<u>√</u>	
Fluoride in Water by IC	E235.F	651628	1	11	9.0	5.0	1	
Nitrate in Water by IC (Low Level)	E235.NO3-L	651631	1	11	9.0	5.0	√	
Nitrite in Water by IC (Low Level)	E235.NO2-L	651632	1	11	9.0	5.0	√	
Sulfate in Water by IC	E235.SO4	651633	1	11	9.0	5.0	1	
TDS by Gravimetry	E162	652293	1	17	5.8	5.0	1	
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	652278	1	15	6.6	5.0	√	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	652134	1	20	5.0	5.0	√	
Total Mercury in Water by CVAAS	E508	655100	1	19	5.2	5.0	1	
Total Metals in Water by CRC ICPMS	E420	652279	1	15	6.6	5.0	√	
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	651625	1	6	16.6	5.0	1	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	653712	1	20	5.0	5.0	1	
TSS by Gravimetry (Low Level)	E160-L	652292	1	17	5.8	5.0	√	
Turbidity by Nephelometry	E121	651627	1	20	5.0	5.0	√	

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Matrix: Water

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

Evaluation: × = QC frequency outside specification; ▼ = QC frequency within specification								
	·	Co	ount		Frequency (%)			
Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation		
E298	651651	1	12	8.3	5.0	✓		
E235.Br-L	651629	1	11	9.0	5.0	✓		
E235.CI-L	651630	1	11	9.0	5.0	✓		
E421.Cr-L	653366	1	18	5.5	5.0	✓		
E509	655111	1	20	5.0	5.0	✓		
E421	653367	1	19	5.2	5.0	✓		
E358-L	651624	1	6	16.6	5.0	✓		
E378-U	651928	1	20	5.0	5.0	✓		
E235.F	651628	1	11	9.0	5.0	✓		
E235.NO3-L	651631	1	11	9.0	5.0	✓		
E235.NO2-L	651632	1	11	9.0	5.0	✓		
E235.SO4	651633	1	11	9.0	5.0	✓		
E420.Cr-L	652278	1	15	6.6	5.0	✓		
E318	652134	1	20	5.0	5.0	✓		
E508	655100	1	19	5.2	5.0	✓		
E420	652279	1	15	6.6	5.0	✓		
E355-L	651625	1	6	16.6	5.0	✓		
E372-U	653712	1	20	5.0	5.0	✓		
	E298 E235.Br-L E235.Cl-L E421.Cr-L E509 E421 E358-L E378-U E235.F E235.NO3-L E235.NO2-L E235.SO4 E420.Cr-L E318 E508 E420 E355-L	Method QC Lot # E298 651651 E235.Br-L 651629 E235.Cl-L 651630 E421.Cr-L 653366 E509 655111 E421 653367 E358-L 651624 E378-U 651928 E235.F 651628 E235.NO3-L 651631 E235.NO2-L 651632 E235.SO4 651633 E420.Cr-L 652278 E318 652134 E508 655100 E420 652279 E355-L 651625	Method QC Lot # Cc E298 651651 1 E235.Br-L 651629 1 E235.Cl-L 651630 1 E421.Cr-L 653366 1 E509 655111 1 E421 653367 1 E358-L 651624 1 E378-U 651928 1 E235.F 651628 1 E235.NO3-L 651631 1 E235.NO2-L 651632 1 E235.SO4 651633 1 E420.Cr-L 652278 1 E318 652134 1 E508 655100 1 E420 652279 1 E355-L 651625 1	Method QC Lot # Count E298 651651 1 12 E235.Br-L 651629 1 11 E235.Cl-L 651630 1 11 E421.Cr-L 653366 1 18 E509 655111 1 20 E421 653367 1 19 E358-L 651624 1 6 E378-U 651928 1 20 E235.F 651628 1 11 E235.NO3-L 651631 1 11 E235.NO2-L 651632 1 11 E235.SO4 651633 1 11 E420.Cr-L 652278 1 15 E318 652134 1 20 E508 655100 1 19 E420 652279 1 15 E355-L 651625 1 6	Method QC Lot # Count QC Regular Actual E298 651651 1 12 8.3 E235.Br-L 651629 1 11 9.0 E235.Cl-L 651630 1 11 9.0 E421.Cr-L 653366 1 18 5.5 E509 655111 1 20 5.0 E421 653367 1 19 5.2 E358-L 651624 1 6 16.6 E378-U 651928 1 20 5.0 E235.F 651628 1 11 9.0 E235.NO3-L 651631 1 11 9.0 E235.NO2-L 651632 1 11 9.0 E235.SO4 651633 1 11 9.0 E235.SO4 651633 1 11 9.0 E420.Cr-L 652278 1 15 6.6 E318 652134 1 20 <t< td=""><td>Method QC Lot # Count QC Regular Actual Expected E298 651651 1 12 8.3 5.0 E235.Br-L 651629 1 11 9.0 5.0 E235.Cl-L 651630 1 11 9.0 5.0 E421.Cr-L 653366 1 18 5.5 5.0 E509 655111 1 20 5.0 5.0 E421 653367 1 19 5.2 5.0 E358-L 651624 1 6 16.6 5.0 E378-U 651928 1 20 5.0 5.0 E235.NO3-L 651631 1 11 9.0 5.0 E235.NO2-L 651632 1 11 9.0 5.0 E235.SO4 651633 1 11 9.0 5.0 E420.Cr-L 652278 1 15 6.6 5.0 E318 652134 1</td></t<>	Method QC Lot # Count QC Regular Actual Expected E298 651651 1 12 8.3 5.0 E235.Br-L 651629 1 11 9.0 5.0 E235.Cl-L 651630 1 11 9.0 5.0 E421.Cr-L 653366 1 18 5.5 5.0 E509 655111 1 20 5.0 5.0 E421 653367 1 19 5.2 5.0 E358-L 651624 1 6 16.6 5.0 E378-U 651928 1 20 5.0 5.0 E235.NO3-L 651631 1 11 9.0 5.0 E235.NO2-L 651632 1 11 9.0 5.0 E235.SO4 651633 1 11 9.0 5.0 E420.Cr-L 652278 1 15 6.6 5.0 E318 652134 1		

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Project : Regional Effects Program



Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is
	O James Facilities			measured by immersion of a conductivity cell with platinum electrodes into a water
mili bu Makan	Calgary - Environmental	10/-4	ADUA 4500 H (sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted
	Calgary - Environmental			at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light
Taiblaity by Nophlolemony	LIZI	Water	74 11/12 100 B (mod)	scatter under defined conditions.
	Calgary - Environmental			Social dilasi delinod estidiatione.
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the
				platinum metal-reference electrode employed, measured in mV. For high accuracy test
	Calgary - Environmental			results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre
	Calgary - Environmental			filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the
	Calgary - Environmental			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre
, ,				filter, with evaporation of the filtrate at $180 \pm 2^{\circ}$ C for 16 hours or to constant weight,
	Calgary - Environmental			with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental	147.4	EDA 000 4 (1)	
Chloride in Water by IC (Low Level)	E235.CI-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
, ,	2200.1		,	detection.
	Calgary - Environmental			
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
Nitrate is Metallical (Level 1991)	Calgary - Environmental	147.4	EDA 000 4 (*** 1)	
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
ĺ			, ,	detection.
	Calgary - Environmental			
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Outrom Francisco			
	Calgary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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 : Regional Effects Program

Dissolved Mercury Water Filtration

ALS

Method / Lab Analytical Methods Matrix Method Reference E421.Cr-L Water APHA 3030 B/EPA Dissolved Chromium in Water by CRC ICPMS Water samples are filtered (0.45 um), preserved with nitric acid, (Low Level) 6020B (mod) Collision/Reaction Cell ICPMS Calgary - Environmental Total Mercury in Water by CVAAS EPA 1631E (mod) E508 Water Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS Calgary - Environmental Dissolved Mercury in Water by CVAAS Water E509 APHA 3030B/EPA Water samples are filtered (0.45 um), preserved with HCI, then undergo a cold-oxidation 1631E (mod) using bromine monochloride prior to reduction with stannous chloride, and analyzed by Calgary - Environmental CVAAS. Dissolved Hardness (Calculated) Water **APHA 2340B** EC100 "Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers Calgary - Environmental to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Ion Balance using Dissolved Metals Water **APHA 1030E** EC101 Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are Calgary - Environmental used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC). Method / Lab Matrix Method Reference Preparation Methods Preparation for Ammonia Sample preparation for Preserved Nutrients Water Quality Analysis. EP298 Water Calgary - Environmental APHA 4500-Norg D Digestion for TKN in water FP318 Water Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the (mod) Calgary - Environmental analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low. Preparation for Total Organic Carbon by Combustion Preparation for Total Organic Carbon by FP355 Water Combustion Calgary - Environmental Water APHA 5310 B (mod) Preparation for Dissolved Organic Carbon Preparation for Dissolved Organic Carbon for EP358 Combustion Calgary - Environmental Digestion for Total Phosphorus in water APHA 4500-P E (mod). Samples are heated with a persulfate digestion reagent. EP372 Water Calgary - Environmental Dissolved Metals Water Filtration EP421 Water **APHA 3030B** Water samples are filtered (0.45 um), and preserved with HNO3.

Water samples are filtered (0.45 um), and preserved with HCl.

Calgary - Environmental

FP509

Calgary - Environmental

Water

APHA 3030B



QUALITY CONTROL REPORT

Work Order : CG2212661

Contact : Teck Coal Limited
Contact : Giovanna Diaz

:421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ----

Project : Regional Effects Program

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site :---

Quote number : Teck Coal Master Quote

No. of samples received : 2
No. of samples analysed : 2

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Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone :+1 403 407 1800

Date Samples Received : 16-Sep-2022 08:50

Date Analysis Commenced : 16-Sep-2022

Issue Date : 20-Sep-2022 19:16

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

This Quality Control Report contains the following information:

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

Address

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Elke Tabora		Calgary Inorganics, Calgary, Alberta
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Mackenzie Lamoureux	Laboratory Analyst	Calgary Metals, Calgary, Alberta
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 Work Order
 : CG2212661

 Client
 : Teck Coal Limited

 Project
 : Regional Effects Program



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

ub-Matrix: Water							Labora	tory Duplicate (D	иг) кероп		
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Physical Tests (QC	Lot: 651627)										
CG2212619-005	Anonymous	turbidity		E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	
Physical Tests (QC	Lot: 652128)										
CG2212650-001	Anonymous	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	
hysical Tests (QC	Lot: 652129)										
CG2212650-001	Anonymous	рН		E108	0.10	pH units	8.34	8.31	0.360%	4%	
hysical Tests (QC	Lot: 652130)										
CG2212650-001	Anonymous	conductivity		E100	2.0	μS/cm	287	288	0.348%	10%	
hysical Tests (QC	Lot: 652131)										
CG2212650-001	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	144	156	7.92%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	6.8	5.4	1.4	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	151	162	6.72%	20%	
hysical Tests (QC	Lot: 652149)										
G2212650-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	268	269	0.186%	15%	
Physical Tests (QC	Lot: 652293)										
CG2212657-001	Anonymous	solids, total dissolved [TDS]		E162	20	mg/L	1400	1420	1.38%	20%	
Anions and Nutrien	ts (QC Lot: 651628)										
CG2212647-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.144	0.144	0.0003	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 651629)										
CG2212647-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	
nions and Nutrien	ts (QC Lot: 651630)										
CG2212647-001	Anonymous	chloride	16887-00-6	E235.CI-L	0.10	mg/L	0.17	0.18	0.009	Diff <2x LOR	
nions and Nutrien	ts (QC Lot: 651631)										
CG2212647-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0455	0.0466	0.0011	Diff <2x LOR	
Anions and Nutrien	its (QC Lot: 651632)										
G2212647-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
nions and Nutrien	its (QC Lot: 651633)										
G2212647-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	46.8	46.7	0.379%	20%	
nions and Nutrien	its (QC Lot: 651651)										
G2212588-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	
	its (QC Lot: 651928)	. ,				•		<u> </u>			

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Client : Teck Coal Limited
Project : Regional Effects Program



Anions and Nutrients (QC Lot: 651929) - continued GG2712876-001 Anonymous phosphate, ortho-, dissolved (as P) 14265-44-2 E378-U 0.0010 mg/L 0.0048 0.0047 0.00008 Diff <24_LG Anions and Nutrients (QC Lot: 652734) GG2712876-001 Anonymous phosphate, ortho-, dissolved (as P) 14265-44-2 E378-U 0.0010 mg/L 0.0770 0.768 0.260% 20% Anions and Nutrients (QC Lot: 653712) GG2712876-001 Anonymous phosphorus, total TrKN) E318 0.059 mg/L 0.770 0.768 0.260% 20% Anions and Nutrients (QC Lot: 653712) GG27128769-001 Anonymous carbon, (GC Lot: 65584) GG27128769-001 Anonymous carbon, ideal organic [OCc] E388-L 0.50 mg/L <0.50 <0.50 0.0033 0.0003 Diff <24_LG Organic Inorganic Carbon (QC Lot: 651625) CG27128769-001 Anonymous carbon, ideal organic [TOC] E385-L 0.50 mg/L <0.50 <0.50 0.0002 Diff <24_LG Organic Inorganic Carbon (QC Lot: 651625) CG2712889-001 Anonymous carbon, ideal organic [TOC] E385-L 0.50 mg/L <0.50 <0.50 0.0002 Diff <24_LG Total Metals (QC Lot: 652278) GG2712885-001 Anonymous chromium, total 7440-47.3 E400.Cc4 0.00020 mg/L 0.00020 <0.00020 0.00020 Diff <24_LG Total Metals (QC Lot: 652279) GG2712885-001 Anonymous aluminum, total 7440-38.0 E420 0.00020 mg/L 0.00031 0.0003 Diff <24_LG E3748-0004 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0005 Diff <24_LG E3749-0005 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0005 Diff <24_LG E3749-000000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0005 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-0000000 Diff <24_LG E3749-000000 Diff <24_LG E3749-0000000			UP) Report	tory Duplicate (D	Labora							Sub-Matrix: Water
Commitment Color		Duplicate Limits			_	Unit	LOR	Method	CAS Number	Analyte	Client sample ID	Laboratory sample ID
Anions and Nutrients (OC Lot: 652134) GG2218696-001 Anonymous phosphorus, total 7723-14-0 E378-U 0.0000 mg/L 0.0003 0.0003 0.0005 0.0002 Dif-2x LG Organic / Inorganic Carbon (OC Lot: 653712) GG2218696-001 Anonymous phosphorus, total 7723-14-0 E378-U 0.0000 mg/L 0.0003 0.0003 0.0005 0.0002 Dif-2x LG Organic / Inorganic Carbon (OC Lot: 651824) GG2218696-001 Anonymous carbon, dissolved organic (DOC) E388-L 0.50 mg/L <0.50 <0.50 <0.50 0.00 Dif-2x LG Organic / Inorganic Carbon (OC Lot: 651825) GG2218696-001 Anonymous carbon, total organic (DOC) E385-L 0.50 mg/L <0.50 <0.50 <0.50 Dif-2x LG Organic / Inorganic Carbon (OC Lot: 651825) GG2218696-001 Anonymous carbon, total organic (DOC) E385-L 0.50 mg/L <0.50 <0.50 <0.50 Dif-2x LG Organic / Inorganic Carbon (OC Lot: 651225) GG2212869-001 Anonymous carbon, total 7440-417-3 E420 Cr-L 0.00020 mg/L <0.00020 0.00020 0.00020 0.00020 Dif-2x LG OC2212888-011 Anonymous chromium, total 7440-98-5 E420 0.00000 mg/L <0.00020 0.00020 0.00110 0.00003 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-5 E420 0.00000 mg/L <0.00020 0.00020 0.00110 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-5 E420 0.00000 mg/L <0.00000 0.00000 0.00000 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-9 E420 0.00000 mg/L <0.00000 0.00000 0.00000 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-9 E420 0.00000 mg/L <0.00000 0.00000 0.00000 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-9 E420 0.00000 mg/L <0.00000 0.00000 0.00000 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-9 E420 0.00000 mg/L <0.000000 0.00000 Dif-2x LG GG2212888-011 Anonymous alaminium, total 7440-98-9 E420 0.000000 mg/L <0.000000 0.000000 Dif-2x LG GG2212888-011 Ano										ontinued	,	
CG2212816-001 Anonymous Kjeldehi nitrogen, total [TKN]	.OR	Diff <2x LOR	0.00008	0.0047	0.0048	mg/L	0.0010	E378-U	14265-44-2	phosphate, ortho-, dissolved (as P)	Anonymous	CG2212626-001
Anions and Nutrients (OC Lot: 653712) CG2212859-001 Anonymous phosphorus, total 7723-14-0 E372-U 0,0020 mg/L 0,0033 0,0035 0,0002 Diff-2x, LC Difference (Carbon (OC Lot: 651624) CG2212859-001 Anonymous carbon, dissolved organic [DOC] — E389-L 0,50 mg/L 40,50 40,50 0 Diff-2x, LC Direction (OC Lot: 651625) CG2212859-001 Anonymous carbon, total organic [TOC] — E385-L 0,50 mg/L 40,50 40,50 0 Diff-2x, LC Direction (OC Lot: 651625) CG2212859-001 Anonymous carbon, total organic [TOC] — E385-L 0,50 mg/L 40,50 40,50 0 Diff-2x, LC Direction (OC Lot: 65278) CG2212859-001 Anonymous carbon, total 7440-47-3 E420 0,00020 mg/L 40,00020 40,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7429-90-5 E420 0,0000 mg/L 40,00020 40,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00020 40,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00020 40,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00020 40,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00020 40,0000 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00031 0,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-98-0 E420 0,00020 mg/L 40,00031 0,00020 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-89-0 E420 0,00000 mg/L 40,000010 0 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-89-0 E420 0,00000 mg/L 40,000010 0 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-89-0 E420 0,00000 mg/L 40,000010 0 D Diff-2x, LC Direction (OC Lot: 652278) CG2212385-001 Anonymous aluminum, total 7440-89-0 E420 0,00000 mg/L 40,000010 0 D Diff-2x, LC Direction (OC Lot: 652278)											s (QC Lot: 652134)	Anions and Nutrient
CG2212896-001		20%	0.260%	0.768	0.770	mg/L	0.050	E318		Kjeldahl nitrogen, total [TKN]	Anonymous	CG2212616-001
Diganic / Inorganic Carbon (OC Lot: 651624) Carbon, dissolved organic [DOC]											s (QC Lot: 653712)	Anions and Nutrient
Caregories Car	OR	Diff <2x LOR	0.0002	0.0035	0.0033	mg/L	0.0020	E372-U	7723-14-0	phosphorus, total	Anonymous	CG2212650-001
Diganic / Inorganic Carbon QC Lot: 651625										1)	Carbon (QC Lot: 65162	Organic / Inorganic (
CG2212850-001 Anonymous Carbon, total organic [TOC]	OR	Diff <2x LOR	0	<0.50	<0.50	mg/L	0.50	E358-L		carbon, dissolved organic [DOC]	Anonymous	CG2212650-001
Total Metals (QC Lot: 652278) CG2212385-001 Anonymous chromium, total T440-47-3 E420.Cr.L 0.00020 mg/L <0.00020 <0.00020 0 Diff <2x.LC										5)	Carbon (QC Lot: 65162	Organic / Inorganic (
CG2212385-001 Anonymous Chromium, total 7440-47-3 E420.Cr-L 0.00020 mg/L <0.00020 <0.00020 0 Diff <2x LC	OR	Diff <2x LOR	0	<0.50	<0.50	mg/L	0.50	E355-L		carbon, total organic [TOC]	Anonymous	CG2212650-001
CG2212385-001 Anonymous Chromium, total 7440-47-3 E420.Cr-L 0.00020 mg/L <0.00020 <0.00020 0 Diff <2x LC											ot: 652278)	Total Metals (QC Lo
Anonymous aluminum, total atlantinum, total antimony, total antimony, total antimony, total antimony, total antimony, total antimony, total arsenic, total 7440-36-0 E420 0.00020 mg/L <0.00020 <0.00020 0 Diff <2x LC arsenic, total 7440-38-2 E420 0.00020 mg/L 0.00031 0.00029 0.00001 Diff <2x LC arsenic, total 7440-38-3 E420 0.00020 mg/L 0.00320 0.0300 6.28% 20% 20% 20% 20% 20% 20% 20% 20% 20% 20	OR	Diff <2x LOR	0	<0.00020	<0.00020	mg/L	0.00020	E420.Cr-L	7440-47-3	chromium, total	<u> </u>	
Anonymous aluminum, total antimory, total anti											nt: 652279)	Total Metals (QC Lo
arsenic, total 7440-38-2 E420 0.00020 mg/L 0.00031 0.00029 0.00001 Diff <2x LC 0.00020 mg/L 0.00320 0.0000 0.00000 Diff <2x LC 0.00040 mg/L 0.000000 0.00000 0.00000 0.000000 0.000000	.OR	Diff <2x LOR	0.00003	0.0110	0.0110	mg/L	0.0060	E420	7429-90-5	aluminum, total	<u>'</u>	• •
barium, total 7440-39-3 E420 0.00020 mg/L 0.0320 0.0300 6.28% 20% beryllium, total 7440-41-7 E420 0.00040 mg/L <0.040 µg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.000100 <0.000100 0 Diff <2x L0 0.00040 pg/L <0.000100 <0.000100 0 Diff <2x L0 0.00040 pg/L <0.000100 <0.000100 0 Diff <2x L0 0.00040 pg/L <0.000100 <0.000100 0 Diff <2x L0 0.00040 pg/L <0.000100 <0.000100 0 Diff <2x L0 0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00041 pg/L <0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00041 pg/L <0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00041 pg/L <0.00040 pg/L <0.0000339 0.000067 Diff <2x L0 0.00041 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 0 Diff <2x L0 0.00041 pg/L <0.00040 pg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.00040 pg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.00040 pg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.00040 pg/L <0.00040 0 Diff <2x L0 0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.000400 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.000400 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.000400 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L <0.00040 pg/L	OR	Diff <2x LOR	0	<0.00020	<0.00020	mg/L	0.00020	E420	7440-36-0	antimony, total		
beryllium, total 7440-41-7 E420 0.000040 mg/L <0.040 μg/L <0.000040 0 Diff <2x LC	.OR	Diff <2x LOR	0.00001	0.00029	0.00031	mg/L	0.00020	E420	7440-38-2	arsenic, total		
bismuth, total 7440-69-9 E420 0.000100 mg/L <0.000100 <0.000100 0 Diff <2x LC cadmium, total 7440-42-8 E420 0.020 mg/L <0.0001		20%	6.28%	0.0300	0.0320	mg/L	0.00020	E420	7440-39-3	barium, total		
boron, total 7440-42-8 E420 0.020 mg/L <0.020 <0.020 0 Diff <2x LC cadmium, total 7440-43-9 E420 0.0000100 mg/L 0.0406 µg/L 0.0000339 0.0000067 Diff <2x LC cadmium, total 7440-70-2 E420 0.100 mg/L 318 304 4.43% 20% cobalt, total 7440-48-4 E420 0.00020 mg/L <0.020 µg/L <0.00020 0 Diff <2x LC cadmium, total 7440-50-8 E420 0.00020 mg/L <0.00100 <0.00100 0 Diff <2x LC cadmium, total 7439-89-6 E420 0.00100 mg/L <0.00100 <0.00100 0 Diff <2x LC cadmium, total 7439-89-6 E420 0.000100 mg/L <0.000100 <0.000100 0 Diff <2x LC cadmium, total 7439-93-2 E420 0.000100 mg/L 0.0380 0.0349 8.66% 20% cadmium, total 7439-95-4 E420 0.00020 mg/L 0.0380 0.0349 8.66% 20% cadmium, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% cadmium, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% cadmium, total 7439-98-7 E420 0.00100 mg/L 0.00194 0.00175 9.93% 20% cadmium, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC cadmium, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC	.OR	Diff <2x LOR	0	<0.000040	<0.040 µg/L	mg/L	0.000040	E420	7440-41-7	beryllium, total		
cadmium, total 7440-43-9 E420 0.0000100 mg/L 0.0406 μg/L 0.0000339 0.0000067 Diff <2x LC calcium, total 7440-70-2 E420 0.100 mg/L 318 304 4.43% 20% cobalt, total 7440-8-4 E420 0.00020 mg/L <0.20 μg/L <0.00020 0 Diff <2x LC copper, total 7440-50-8 E420 0.00100 mg/L <0.00100 0 O.00100 0 Diff <2x LC copper, total 7439-89-6 E420 0.000100 mg/L <0.00100 0 O.00100 0 Diff <2x LC copper, total 7439-92-1 E420 0.000100 mg/L <0.000100 0 O.00100 0 Diff <2x LC copper, total 7439-93-2 E420 0.000100 mg/L <0.000100 0 O.000100	.OR	Diff <2x LOR	0	<0.000100	<0.000100	mg/L	0.000100	E420	7440-69-9	bismuth, total		
calcium, total 7440-70-2 E420 0.100 mg/L 318 304 4.43% 20% cobalt, total 7440-48-4 E420 0.00020 mg/L <0.20 µg/L <0.00020 0 Diff <2x LC copper, total 7440-50-8 E420 0.00100 mg/L <0.00100 <0.00100 0 Diff <2x LC copper, total 7439-89-6 E420 0.00100 mg/L <0.00100 <0.00100 0 Diff <2x LC copper, total 7439-99-1 E420 0.00100 mg/L <0.000100 <0.000100 0 Diff <2x LC copper, total 7439-93-2 E420 0.000100 mg/L <0.000100 <0.000100 0 Diff <2x LC copper, total 7439-93-2 E420 0.000100 mg/L 0.0380 0.0349 8.66% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% mickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00100 mg/L 0.00100 Diff <2x LC copper, total 74	.OR	Diff <2x LOR	0	<0.020	<0.020	mg/L	0.020	E420	7440-42-8	boron, total		
calcium, total 7440-70-2 E420 0.100 mg/L 318 304 4.43% 20% cobalt, total 7440-48-4 E420 0.00020 mg/L <0.20 µg/L <0.00020 0 Diff <2x LC copper, total 7440-50-8 E420 0.00100 mg/L <0.00100 <0.00100 0 Diff <2x LC copper, total 7439-89-6 E420 0.020 mg/L <0.020 <0.020 0 Diff <2x LC copper, total 7439-92-1 E420 0.00100 mg/L <0.000100 <0.00100 0 Diff <2x LC copper, total 7439-93-2 E420 0.000100 mg/L <0.000100 <0.000100 0 Diff <2x LC copper, total 7439-93-2 E420 0.0020 mg/L 0.0380 0.0349 8.66% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.00100 mg/L 0.00194 0.00175 9.93% 20% mickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.0100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC copper, total 7440-09-7 E420 0.00100 m	.OR	Diff <2x LOR	0.0000067	0.0000339	0.0406 µg/L	mg/L	0.0000100	E420	7440-43-9	cadmium, total		
cobalt, total 7440-48-4 E420 0.00020 mg/L <0.20 μg/L		20%	4.43%	304	318	-	0.100	E420	7440-70-2			
copper, total 7440-50-8 E420 0.00100 mg/L <0.00100 <0.00100 0 Diff <2x LC iron, total 7439-89-6 E420 0.020 mg/L <0.020	.OR	Diff <2x LOR	0	<0.00020	<0.20 µg/L	-	0.00020	E420	7440-48-4			
iron, total 7439-89-6 E420 0.020 mg/L <0.020 <0.020 0 Diff <2x L0 lead, total 7439-92-1 E420 0.000100 mg/L <0.000100 <0.000100 0 Diff <2x L0 lithium, total 7439-93-2 E420 0.0020 mg/L 0.0380 0.0349 8.66% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x L0 potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%	.OR	Diff <2x LOR	0			-				, i		
lead, total 7439-92-1 E420 0.000100 mg/L <0.000100 0 Diff <2x LO lithium, total 7439-93-2 E420 0.0020 mg/L 0.0380 0.0349 8.66% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.00100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LO potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%	.OR	Diff <2x LOR	0	<0.020	<0.020	-	0.020	E420	7439-89-6			
lithium, total 7439-93-2 E420 0.0020 mg/L 0.0380 0.0349 8.66% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%	.OR	Diff <2x LOR	0	<0.000100	<0.000100	-	0.000100	E420	7439-92-1			
magnesium, total 7439-95-4 E420 0.0100 mg/L 186 178 4.04% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC			8.66%			-						
manganese, total 7439-96-5 E420 0.00020 mg/L 0.0264 0.0255 3.63% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%		20%	4.04%	178		-	0.0100	E420		· ·		
molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00194 0.00175 9.93% 20% nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x LC potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%						-						
nickel, total 7440-02-0 E420 0.00100 mg/L 0.00108 0.00106 0.00002 Diff <2x L0 potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%						-						
potassium, total 7440-09-7 E420 0.100 mg/L 3.69 3.52 4.69% 20%	.OR	Diff <2x LOR				-						
						-						
55.5						· ·				<u>'</u>		
silicon, total 7440-21-3 E420 0.20 mg/L 6.30 5.96 5.64% 20%						ŭ				,		
	OR	Diff <2x LOR				-						
solium, total 7440-23-5 E420 0.100 mg/L 20.2 19.4 3.98% 20%						-				, i		

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Total Metals (QC Lo	ot: 652279) - continu	ed									
CG2212385-001	Anonymous	strontium, total	7440-24-6	E420	0.00040	mg/L	0.208	0.200	3.65%	20%	
		sulfur, total	7704-34-9	E420	1.00	mg/L	350	329	6.05%	20%	
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000109	0.000105	0.000004	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.00759	0.00737	2.94%	20%	
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	
Total Metals (QC Lo	ot: 655100)										
CG2212650-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	0.0000055	0.0000005	Diff <2x LOR	
Dissolved Metals ((QC Lot: 653366)										
CG2212376-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00018	0.00017	0.00002	Diff <2x LOR	
Dissolved Metals (QC Lot: 653367)										
CG2212376-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
	arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00014	0.00012	0.00002	Diff <2x LOR		
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0432	0.0414	4.29%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0050 µg/L	<0.0000050	0	Diff <2x LOR	
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	44.6	43.6	2.14%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0038	0.0036	0.0001	Diff <2x LOR	
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	12.1	11.7	2.73%	20%	
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000923	0.000900	2.55%	20%	
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.260	0.262	0.001	Diff <2x LOR	
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	3.40 µg/L	0.00320	6.14%	20%	
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.63	1.56	4.72%	20%	
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	

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Work Order : CG2212661
Client : Teck Coal Limited
Project : Regional Effects Program



Sub-Matrix: Water							Labora	tory Duplicate (DU	JP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 653367) - contin	ued									
CG2212376-001	Anonymous	sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.30	1.27	2.53%	20%	
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.159	0.154	2.87%	20%	
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	19.1	18.0	5.64%	20%	
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00111	0.00119	7.45%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0016	0.0013	0.0003	Diff <2x LOR	
Dissolved Metals (QC Lot: 655111)										
CG2212650-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.000050	0	Diff <2x LOR	

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 Work Order
 : CG2212661

 Client
 : Teck Coal Limited

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 : Regional Effects Program



Method Blank (MB) Report

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

Sub-Matrix: Water

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 651627)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 652128)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 652130)					
conductivity	E100	1	μS/cm	<1.0	
Physical Tests (QCLot: 652131)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 652292)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 652293)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 651628)					
fluoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 651629)					
bromide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 651630)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 651631)					
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 651632)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 651633)					
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 651651)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 651928)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 652134)					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 653712)					

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Client : Teck Coal Limited
Project : Regional Effects Program



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 65371						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	
Organic / Inorganic Carbon (QCLot:						
carbon, dissolved organic [DOC]		E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot:	<u> </u>					
carbon, total organic [TOC]		E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 652278)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 652279)						
lluminum, total	7429-90-5		0.003	mg/L	<0.0030	
antimony, total	7440-36-0		0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2		0.0001	mg/L	<0.00010	
parium, total	7440-39-3		0.0001	mg/L	<0.00010	
eryllium, total	7440-41-7		0.00002	mg/L	<0.000020	
ismuth, total	7440-69-9		0.00005	mg/L	<0.000050	
oron, total	7440-42-8	E420	0.01	mg/L	<0.010	
admium, total	7440-43-9	E420	0.000005	mg/L	<0.000050	
alcium, total	7440-70-2	E420	0.05	mg/L	<0.050	
obalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	
opper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	
ron, total	7439-89-6	E420	0.01	mg/L	<0.010	
ead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	
thium, total	7439-93-2	E420	0.001	mg/L	<0.0010	
nagnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	
nanganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	
nolybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	
ickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	
otassium, total	7440-09-7	E420	0.05	mg/L	<0.050	
elenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	
ilicon, total	7440-21-3	E420	0.1	mg/L	<0.10	
ilver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	
odium, total	7440-23-5	E420	0.05	mg/L	<0.050	
trontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	
ulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	
hallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	
in, total	7440-31-5	E420	0.0001	mg/L	<0.00010	
itanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	

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Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 652279) -	continued					
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	
Fotal Metals (QCLot: 655100)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.000050	
Dissolved Metals (QCLot: 65336	66)					
hromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 65336	67)					
luminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	
parium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	
peryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	
pismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	
poron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	
admium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	
alcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	
ron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	
ead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	
thium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	
nagnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	
nanganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	
nolybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	
ootassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	
ilicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	
trontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	
hallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	

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Sub-Matrix: Water

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 653367) - contin	ued				
uranium, dissolved	7440-61-1 E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2 E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6 E421	0.001	mg/L	<0.0010	
Dissolved Metals (QCLot: 655111)					
mercury, dissolved	7439-97-6 E509	0.000005	mg/L	<0.000050	

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water	Laboratory Control Sample (LCS) Report									
					Spike Recovery (%) Recovery Limits (%)					
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Physical Tests (QCLot: 651627)										
turbidity		E121	0.1	NTU	200 NTU	113	85.0	115		
Physical Tests (QCLot: 652128)										
acidity (as CaCO3)		E283	2	mg/L	50 mg/L	106	85.0	115		
Physical Tests (QCLot: 652129)										
рН		E108		pH units	7 pH units	100	98.6	101		
Physical Tests (QCLot: 652130)										
conductivity		E100	1	μS/cm	146.9 μS/cm	97.3	90.0	110		
Physical Tests (QCLot: 652131)										
alkalinity, total (as CaCO3)		E290	1	mg/L	500 mg/L	101	85.0	115		
Physical Tests (QCLot: 652149)									1	
oxidation-reduction potential [ORP]		E125		mV	220 mV	100	95.4	104		
Physical Tests (QCLot: 652292)										
solids, total suspended [TSS]		E160-L	1	mg/L	150 mg/L	88.9	85.0	115		
Physical Tests (QCLot: 652293)										
solids, total dissolved [TDS]		E162	10	mg/L	1000 mg/L	92.5	85.0	115		
Anions and Nutrients (QCLot: 651628)										
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	103	90.0	110		
Anions and Nutrients (QCLot: 651629)										
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	102	85.0	115		
Anions and Nutrients (QCLot: 651630)										
chloride	16887-00-6	E235.CI-L	0.1	mg/L	100 mg/L	101	90.0	110		
Anions and Nutrients (QCLot: 651631)										
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110		
Anions and Nutrients (QCLot: 651632)										
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.7	90.0	110		
Anions and Nutrients (QCLot: 651633)									I	
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110		
Anions and Nutrients (QCLot: 651651)									I	
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.4	85.0	115		
Anions and Nutrients (QCLot: 651928)									I	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	92.8	80.0	120		
Anions and Nutrients (QCLot: 652134)					-				I	
Allions and Nutrients (QCLOL 032134)										

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ub-Matrix: Water					Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Anions and Nutrients (QCLot: 652134) - continued											
Kjeldahl nitrogen, total [TKN]		E318	0.05	mg/L	4 mg/L	95.2	75.0	125			
Anions and Nutrients (QCLot: 653712)											
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.03 mg/L	95.2	80.0	120			
Organic / Inorganic Carbon (QCLot: 651624)											
carbon, dissolved organic [DOC]		E358-L	0.5	mg/L	8.57 mg/L	97.9	80.0	120			
Organic / Inorganic Carbon (QCLot: 651625)											
carbon, total organic [TOC]		E355-L	0.5	mg/L	8.57 mg/L	102	80.0	120			
Total Metals (QCLot: 652278)											
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	89.3	80.0	120			
Total Metals (QCLot: 652279)											
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	103	80.0	120			
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	108	80.0	120			
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	90.0	80.0	120			
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	105	80.0	120			
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	88.2	80.0	120			
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	91.5	80.0	120			
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	86.2	80.0	120			
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	88.6	80.0	120			
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120			
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	87.4	80.0	120			
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	89.1	80.0	120			
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	108	80.0	120			
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	90.7	80.0	120			
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	99.2	80.0	120			
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	87.4	80.0	120			
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	95.1	80.0	120			
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	93.1	80.0	120			
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	91.1	80.0	120			
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	90.4	80.0	120			
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	84.0	80.0	120			
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	108	60.0	140			
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	86.2	80.0	120			
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	90.3	80.0	120			
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	95.5	80.0	120			
sulfur, total	7704-34-9	I	0.5	mg/L	50 mg/L	97.6	80.0	120			

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Total Marias (OCLOT: 652279) - continued 7440,74.0 240,75.0	Sub-Matrix: Water	b-Matrix: Water					Laboratory Control Sample (LCS) Report						
Total Metals (OCLot: 652279) - continued						Spike	Recovery (%)	Recovery	Limits (%)				
Treatment Trea	Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier			
ten, total 7440-15, E420 0.0001 mg,L 0.5 mg	Total Metals (QCLot: 652279) - continu	ıed											
Section Community Commun	thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	91.5	80.0	120				
urantum, total 744,0 8-1.	tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	104	80.0	120				
Avanadium, totals 7440-822 E420 0.0005 mgl. 0.5 mgl. 0.5 mgl. 108	titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.4	80.0	120				
Total Martals (QCLot: 653100) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653366) **Total Martals (QCLot: 653367) **Total Martals (QCLot: 653667) **	uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	102	80.0	120				
Total Metals (QCLot: 655100) Trispers	vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	89.7	80.0	120				
Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653367) Preserved Meta	zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	108	80.0	120				
Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653366) Preserved Metals (QCLot: 653367) Preserved Meta	Total Metals (QCLot: 655100)												
Dissolved Metals (QCLot: 653367)	mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	118	80.0	120				
Dissolved Metals (QCLot: 653367)													
Dissolved Metals (QCLot: 653367) At29-90-5 E421 0.001 mg/L 2 mg/L 104 80.0 120 aluminum, dissolved 7440-96-0 E421 0.0001 mg/L 1 mg/L 101 80.0 120 aluminum, dissolved 7440-96-0 E421 0.0001 mg/L 1 mg/L 97.7 80.0 120 2 mg/L 104 80.0 120 2 mg/L 104 80.0 120 2 mg/L 104 1 mg/L 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 104 105 106 120 2 mg/L 106	Dissolved Metals (QCLot: 653366)												
alamimum, dissolved 7429-90.5 [5421 0.001 mg/L 1 mg/L 101 80.0 120 ansenic, dissolved 7440-360 [421 0.0001 mg/L 1 mg/L 101 80.0 120 bartum, dissolved 7440-384 [421 0.0001 mg/L 1 mg/L 97.7 80.0 120 bartum, dissolved 7440-384 [421 0.0001 mg/L 0.25 mg/L 97.2 80.0 120 bartum, dissolved 7440-48-9 [421 0.0002 mg/L 0.1 mg/L 98.6 80.0 120 beryllium, dissolved 7440-89- [421 0.0005 mg/L 1 mg/L 98.6 80.0 120 beryllium, dissolved 7440-48-9 [421 0.0005 mg/L 1 mg/L 98.6 80.0 120 boron, dissolved 7440-48-9 [421 0.0005 mg/L 0.1 mg/L 98.6 80.0 120 cadmium, dissolved 7440-48-9 [421 0.0005 mg/L 0.1 mg/L 99.0 80.0 120 cadmium, dissolved 7440-48-9 [421 0.0005 mg/L 0.5 mg/L 99.0 80.0 120 cobalt, dissolved 7440-48- [421 0.0001 mg/L 0.25 mg/L 99.0 80.0 120 cobalt, dissolved 7440-89- [421 0.0001 mg/L 0.25 mg/L 99.0 80.0 120 copper, dissolved 7440-89- [421 0.0001 mg/L 0.25 mg/L 99.0 80.0 120 copper, dissolved 7440-89- [421 0.0005 mg/L 0.5 mg/L 99.0 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.5 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.5 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.5 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.5 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.5 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.6 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7439-89- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7440-49- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7440-49- [421 0.0005 mg/L 0.5 mg/L 99.7 80.0 120 copper, dissolved 7440-49- [421 0.0005 mg/L 0.5 mg	chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.4	80.0	120				
antimony, dissolved 7440-38-0 [2421 0.0001 mg/L 1 mg/L 97.7 80.0 120 arsenic, dissolved 7440-38-3 [2421 0.0001 mg/L 1 mg/L 97.7 80.0 120 arsenic, dissolved 7440-38-3 [2421 0.0001 mg/L 0.25 mg/L 97.2 80.0 120 benylium, dissolved 7440-48-9 [2421 0.00002 mg/L 0.1 mg/L 98.6 80.0 120 bismuth, dissolved 7440-48-9 [2421 0.00005 mg/L 1 mg/L 98.6 80.0 120 bismuth, dissolved 7440-48-9 [2421 0.00005 mg/L 1 mg/L 98.6 80.0 120 bismuth, dissolved 7440-48-9 [2421 0.00005 mg/L 0.1 mg/L 98.6 80.0 120 calcium, dissolved 7440-48-9 [2421 0.00005 mg/L 0.1 mg/L 98.6 80.0 120 calcium, dissolved 7440-48-9 [2421 0.0005 mg/L 0.1 mg/L 96.4 80.0 120 calcium, dissolved 7440-48-9 [2421 0.005 mg/L 50 mg/L 99.0 80.0 120 calcium, dissolved 7440-48-9 [2421 0.005 mg/L 0.25 mg/L 99.0 80.0 120 cobalt, dissolved 7440-48-9 [2421 0.0001 mg/L 0.25 mg/L 99.0 80.0 120 cobalt, dissolved 7440-48-9 [2421 0.0001 mg/L 0.25 mg/L 99.0 80.0 120 tied, dissolved 7439-98-9 [2421 0.0001 mg/L 0.5 mg/L 99.6 80.0 120 lied, dissolved 7439-98-9 [2421 0.0005 mg/L 0.5 mg/L 94.6 80.0 120 mangeneium, dissolved 7439-98-9 [2421 0.001 mg/L 0.5 mg/L 94.6 80.0 120 mangeneium, dissolved 7439-98-9 [2421 0.001 mg/L 0.5 mg/L 94.6 80.0 120 mangeneium, dissolved 7439-98-9 [2421 0.0005 mg/L 0.5 mg/L 94.6 80.0 120 mangeneium, dissolved 7439-98-9 [2421 0.0005 mg/L 0.5 mg/L 96.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 96.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 97.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 97.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.5 mg/L 97.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.1 mg/L 97.8 80.0 120 molybdenum, dissolved 7440-04-9 [2421 0.0005 mg/L 0.1 mg/L 97.8 80.0 120 molybdenum, dissolved	Dissolved Metals (QCLot: 653367)												
arsenic, dissolved 7440-38-2 E421 0.0001 mg/L 1 mg/L 97.7 80.0 120	aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120				
barlum, dissolved 7440-39-3 E421 0.0001 mg/L 0.25 mg/L 97.2 80.0 120	antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120				
beryllium, dissolved 7440-41-7 E421 0.00002 mg/L 0.1 mg/L 98.6 80.0 120	arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	97.7	80.0	120				
bismuth, dissolved 7440-68-9	barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	97.2	80.0	120				
boron, dissolved 7440-42-8 E421 0.01 mg/L 1 mg/L 96.6 80.0 120	beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.6	80.0	120				
cadmium, dissolved 7440-43-9 E421 0.000005 mg/L 0.1 mg/L 96.4 80.0 120	bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.6	80.0	120				
Eaclium, dissolved 7440-70-2 E421	boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	86.6	80.0	120				
cobalt, dissolved 7440-48-4 E421 0.0001 mg/L 0.25 mg/L 98.0 80.0 120	cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.4	80.0	120				
copper, dissolved 7440-50-8 E421 0.0002 mg/L 0.25 mg/L 95.5 80.0 120 lead, dissolved 7439-89-6 E421 0.001 mg/L 1 mg/L 113 80.0 120 lead, dissolved 7439-92-1 E421 0.0005 mg/L 0.5 mg/L 94.6 80.0 120 lithium, dissolved 7439-95-4 E421 0.001 mg/L 0.25 mg/L 96.8 80.0 120 magnesium, dissolved 7439-96-5 E421 0.005 mg/L 50 mg/L 96.8 80.0 120 midsel, dissolved 7439-96-7 E421 0.0005 mg/L 0.25 mg/L 101 80.0 120 midsel, dissolved 7440-02-0 E421 0.0005 mg/L 0.5 mg/L 101 80.0 120 molybdenum, dissolved 7440-02-0 E421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 selenium, dissolved 7440-02-0 E421 0.005 mg/L 50 mg/L 98.7 80.0 120 selenium, dissolved 7440-21-3 E421 0.0005 mg/L 1 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-4 E421 0.005 mg/L 10 mg/L 10 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-5 E421 0.0005 mg/L 10 mg/L 10 mg/L 103 60.0 140 selenium, dissolved 7440-22-5 E421 0.0001 mg/L 0.5 mg/L 10 mg/L 10 mg/L 103 60.0 140 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 10 mg/L 103 60.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 100 80.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 7440-22-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.1 mg/L 90.7 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolved 97.400-24-6 E421 0.0001 mg/L 0.25 mg/L 97.8 80.0 120 selenium, dissolv	calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.0	80.0	120				
iron, dissolved 7439-89-6 E421 0.01 mg/L 1 mg/L 113 80.0 120	cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.0	80.0	120				
lead, dissolved 7439-92-1 E421 0.00005 mg/L 0.5 mg/L 94.6 80.0 120	copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	95.5	80.0	120				
lithium, dissolved 7439-93-2 E421 0.001 mg/L 0.25 mg/L 104 80.0 120	iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	113	80.0	120				
magnesium, dissolved 7439-95-4 E421 0.005 mg/L 50 mg/L 96.8 80.0 120 manganese, dissolved 7439-96-5 E421 0.0001 mg/L 0.25 mg/L 101 80.0 120 molybdenum, dissolved 7440-02-0 E421 0.0005 mg/L 0.55 mg/L 97.4 80.0 120 potassium, dissolved 7440-09-7 E421 0.005 mg/L 50 mg/L 98.7 80.0 120 selenium, dissolved 7782-49-2 E421 0.0005 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10	lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	94.6	80.0	120				
manganese, dissolved 7439-96-5 E421 0.0001 mg/L 0.25 mg/L 101 80.0 120 molybdenum, dissolved 7439-98-7 E421 0.0005 mg/L 0.55 mg/L 101 80.0 120 nickel, dissolved 7440-02-0 E421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 potassium, dissolved 7440-09-7 E421 0.05 mg/L 50 mg/L 98.7 80.0 120 selenium, dissolved 7782-49-2 E421 0.05 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L	lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	104	80.0	120				
molybdenum, dissolved 7439-98-7 E421 0.00005 mg/L 0.25 mg/L 101 80.0 120 mickel, dissolved 7440-02-0 E421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 potassium, dissolved 98.7 80.0 120 selenium, dissolved 7782-49-2 E421 0.0005 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L 103 60.0 140 silver, dissolved 7440-22-4 E421 0.0001 mg/L 0.1 mg/L 86.3 80.0 120 sodium, dissolved 7440-23-5 E421 0.05 mg/L 0.1 mg/L 97.8 80.0 120 strontium, dissolved 7440-23-5 E421 0.0001 mg/L 0.1 mg/L 97.8 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120 strontium, dissolved 97.8 80.0 120 strontium, dissolved 97.8 80.0 120	magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.8	80.0	120				
nickel, dissolved 7440-02-0 E421 0.0005 mg/L 0.5 mg/L 97.4 80.0 120 potassium, dissolved 7440-09-7 E421 0.05 mg/L 50 mg/L 98.7 80.0 120 selenium, dissolved 7782-49-2 E421 0.00005 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L 103 60.0 140 silver, dissolved 7440-22-4 E421 0.0001 mg/L 0.1 mg/L 86.3 80.0 120 strontium, dissolved 7440-23-5 E421 0.05 mg/L 50 mg/L 50 mg/L 97.8 80.0 120 strontium, dissolved 7440-23-5 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120				
potassium, dissolved 7440-09-7 E421 0.05 mg/L 50 mg/L 98.7 80.0 120 selenium, dissolved 7782-49-2 E421 0.00005 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L 103 60.0 140 silver, dissolved 7440-22-4 E421 0.0001 mg/L 0.1 mg/L 86.3 80.0 120 strontium, dissolved 7440-23-5 E421 0.002 mg/L 50 mg/L 50 mg/L 100 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120				
selenium, dissolved 7782-49-2 E421 0.0005 mg/L 1 mg/L 90.7 80.0 120 silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L 103 60.0 140 silver, dissolved 7440-22-4 E421 0.0001 mg/L 0.1 mg/L 86.3 80.0 120 sodium, dissolved 7440-23-5 E421 0.05 mg/L 50 mg/L 100 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.4	80.0	120				
silicon, dissolved 7440-21-3 E421 0.05 mg/L 10 mg/L 103 60.0 140 silver, dissolved 7440-22-4 E421 0.00001 mg/L 0.1 mg/L 86.3 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	98.7	80.0	120				
silver, dissolved 7440-22-4 E421 0.00001 mg/L 0.1 mg/L 86.3 80.0 120 strontium, dissolved 7440-23-5 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	90.7	80.0	120				
sodium, dissolved 7440-23-5 E421 0.05 mg/L 50 mg/L 100 80.0 120 strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	103	60.0	140				
strontium, dissolved 7440-24-6 E421 0.0002 mg/L 0.25 mg/L 97.8 80.0 120	silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	86.3	80.0	120				
	sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	100	80.0	120				
sulfur, dissolved 7704-34-9 E421 0.5 mg/L 50 mg/L 96.7 80.0 120	strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	97.8	80.0	120				
	sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	96.7	80.0	120				

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ıb-Matrix: Water					Laboratory Control Sample (LCS) Report					
					Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Dissolved Metals (QCLot: 653367) - co	ntinued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	95.4	80.0	120		
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.8	80.0	120		
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	92.7	80.0	120		
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	92.8	80.0	120		
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.0	80.0	120		
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.4	80.0	120		
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.8	80.0	120		

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 : Teck Coal Limited

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 : Regional Effects Program



Matrix Spike (MS) Report

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

Sub-Matrix: Water			Matrix Spike (MS) Report							
					Spike		Recovery (%)	Recovery	Limits (%)	
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	ents (QCLot: 651628)								
CG2212647-002	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 651629)								·
CG2212647-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.510 mg/L	0.5 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 651630)								
CG2212647-002	Anonymous	chloride	16887-00-6	E235.CI-L	100 mg/L	100 mg/L	100	75.0	125	
Anions and Nutri	ents (QCLot: 651631)								
CG2212647-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.53 mg/L	2.5 mg/L	101	75.0	125	
Anions and Nutri	ents (QCLot: 651632)								
CG2212647-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.515 mg/L	0.5 mg/L	103	75.0	125	
Anions and Nutri	ents (QCLot: 651633)								
CG2212647-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	
Anions and Nutri	ents (QCLot: 651651)								
CG2212588-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.106 mg/L	0.1 mg/L	106	75.0	125	
Anions and Nutri	ents (QCLot: 651928)								
CG2212650-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0514 mg/L	0.05 mg/L	103	70.0	130	
Anions and Nutri	ents (QCLot: 652134)								
CG2212647-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.47 mg/L	2.5 mg/L	98.8	70.0	130	
Anions and Nutri	ents (QCLot: 653712)								
CG2212650-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0504 mg/L	0.05 mg/L	101	70.0	130	
Organic / Inorgar	nic Carbon (QCLot: 6	51624)								
CG2212650-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	5.19 mg/L	5 mg/L	104	70.0	130	
Organic / Inorgar	nic Carbon (QCLot: 6	51625)								
CG2212650-001	Anonymous	carbon, total organic [TOC]		E355-L	5.52 mg/L	5 mg/L	110	70.0	130	
Total Metals (QC	Lot: 652278)									
CG2212385-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.459 mg/L	0.4 mg/L	115	70.0	130	
Fotal Metals (QC	Lot: 652279)									
CG2212385-002	Anonymous	aluminum, total	7429-90-5	E420	2.34 mg/L	2 mg/L	117	70.0	130	
		antimony, total	7440-36-0	E420	0.215 mg/L	0.2 mg/L	107	70.0	130	

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Sub-Matrix: Water							Matrix Spik	re (MS) Report		
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie
otal Metals (QC	Lot: 652279) - contir	nued								
CG2212385-002	Anonymous	arsenic, total	7440-38-2	E420	0.224 mg/L	0.2 mg/L	112	70.0	130	
		barium, total	7440-39-3	E420	0.242 mg/L	0.2 mg/L	121	70.0	130	
		beryllium, total	7440-41-7	E420	0.414 mg/L	0.4 mg/L	103	70.0	130	
		bismuth, total	7440-69-9	E420	0.0981 mg/L	0.1 mg/L	98.1	70.0	130	
		boron, total	7440-42-8	E420	1.02 mg/L	1 mg/L	102	70.0	130	
		cadmium, total	7440-43-9	E420	0.0472 mg/L	0.04 mg/L	118	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.232 mg/L	0.2 mg/L	116	70.0	130	
		copper, total	7440-50-8	E420	0.224 mg/L	0.2 mg/L	112	70.0	130	
		iron, total	7439-89-6	E420	23.1 mg/L	20 mg/L	116	70.0	130	
		lead, total	7439-92-1	E420	0.202 mg/L	0.2 mg/L	101	70.0	130	
		lithium, total	7439-93-2	E420	1.03 mg/L	1 mg/L	103	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	
		molybdenum, total	7439-98-7	E420	0.213 mg/L	0.2 mg/L	106	70.0	130	
		nickel, total	7440-02-0	E420	0.452 mg/L	0.4 mg/L	113	70.0	130	
		potassium, total	7440-09-7	E420	47.4 mg/L	40 mg/L	118	70.0	130	
		selenium, total	7782-49-2	E420	0.472 mg/L	0.4 mg/L	118	70.0	130	
		silicon, total	7440-21-3	E420	92.1 mg/L	100 mg/L	92.1	70.0	130	
		silver, total	7440-22-4	E420	0.0429 mg/L	0.04 mg/L	107	70.0	130	
		sodium, total	7440-23-5	E420	16.3 mg/L	20 mg/L	81.3	70.0	130	
		strontium, total	7440-24-6	E420	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, total	7704-34-9	E420	ND mg/L	200 mg/L	ND	70.0	130	
		thallium, total	7440-28-0	E420	0.0402 mg/L	0.04 mg/L	100	70.0	130	
		tin, total	7440-31-5	E420	0.208 mg/L	0.2 mg/L	104	70.0	130	
		titanium, total	7440-32-6	E420	0.450 mg/L	0.4 mg/L	112	70.0	130	
		uranium, total	7440-61-1	E420	0.0416 mg/L	0.04 mg/L	104	70.0	130	
		vanadium, total	7440-62-2	E420	1.17 mg/L	1 mg/L	117	70.0	130	
		zinc, total	7440-66-6	E420	4.52 mg/L	4 mg/L	113	70.0	130	
otal Metals (QC	Lot: 655100)									
CG2212650-002	Anonymous	mercury, total	7439-97-6	E508	0.0000937 mg/L	0.0001 mg/L	93.7	70.0	130	
issolved Metals	(QCLot: 653366)									
CG2212376-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.366 mg/L	0.4 mg/L	91.5	70.0	130	
issolved Metals	(QCLot: 653367)									
CG2212376-002	Anonymous	aluminum, dissolved	7429-90-5	E421	1.87 mg/L	2 mg/L	93.6	70.0	130	
	•	antimony, dissolved	7440-36-0	E421	0.188 mg/L	0.2 mg/L	94.1	70.0	130	

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Sub-Matrix: Water	ub-Matrix: Water						Matrix Spike (MS) Report						
					Sp	ike	Recovery (%)	Recovery	Limits (%)				
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier			
	(QCLot: 653367) -	continued											
CG2212376-002	Anonymous	arsenic, dissolved	7440-38-2	E421	0.176 mg/L	0.2 mg/L	88.0	70.0	130				
		barium, dissolved	7440-39-3	E421	0.182 mg/L	0.2 mg/L	91.3	70.0	130				
		beryllium, dissolved	7440-41-7	E421	0.369 mg/L	0.4 mg/L	92.2	70.0	130				
		bismuth, dissolved	7440-69-9	E421	0.0851 mg/L	0.1 mg/L	85.1	70.0	130				
		boron, dissolved	7440-42-8	E421	0.824 mg/L	1 mg/L	82.4	70.0	130				
		cadmium, dissolved	7440-43-9	E421	0.0355 mg/L	0.04 mg/L	88.8	70.0	130				
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130				
		cobalt, dissolved	7440-48-4	E421	0.182 mg/L	0.2 mg/L	91.0	70.0	130				
		copper, dissolved	7440-50-8	E421	0.181 mg/L	0.2 mg/L	90.4	70.0	130				
		iron, dissolved	7439-89-6	E421	17.9 mg/L	20 mg/L	89.7	70.0	130				
		lead, dissolved	7439-92-1	E421	0.174 mg/L	0.2 mg/L	86.9	70.0	130				
		lithium, dissolved	7439-93-2	E421	0.983 mg/L	1 mg/L	98.3	70.0	130				
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130				
		manganese, dissolved	7439-96-5	E421	0.182 mg/L	0.2 mg/L	91.2	70.0	130				
		molybdenum, dissolved	7439-98-7	E421	0.184 mg/L	0.2 mg/L	92.2	70.0	130				
		nickel, dissolved	7440-02-0	E421	0.363 mg/L	0.4 mg/L	90.8	70.0	130				
		potassium, dissolved	7440-09-7	E421	35.4 mg/L	40 mg/L	88.6	70.0	130				
		selenium, dissolved	7782-49-2	E421	0.339 mg/L	0.4 mg/L	84.8	70.0	130				
		silicon, dissolved	7440-21-3	E421	72.6 mg/L	100 mg/L	72.6	70.0	130				
		silver, dissolved	7440-22-4	E421	0.0363 mg/L	0.04 mg/L	90.7	70.0	130				
		sodium, dissolved	7440-23-5	E421	18.6 mg/L	20 mg/L	92.8	70.0	130				
		strontium, dissolved	7440-24-6	E421	0.183 mg/L	0.2 mg/L	91.4	70.0	130				
		sulfur, dissolved	7704-34-9	E421	171 mg/L	200 mg/L	85.4	70.0	130				
		thallium, dissolved	7440-28-0	E421	0.0342 mg/L	0.04 mg/L	85.4	70.0	130				
		tin, dissolved	7440-31-5	E421	0.176 mg/L	0.2 mg/L	88.2	70.0	130				
		titanium, dissolved	7440-32-6	E421	0.355 mg/L	0.4 mg/L	88.8	70.0	130				
		uranium, dissolved	7440-61-1	E421	0.0347 mg/L	0.04 mg/L	86.8	70.0	130				
		vanadium, dissolved	7440-62-2	E421	0.881 mg/L	1 mg/L	88.1	70.0	130				
		zinc, dissolved	7440-66-6	E421	3.80 mg/L	4 mg/L	95.1	70.0	130				
Dissolved Metals	(QCLot: 655111)												
CG2212650-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000938 mg/L	0.0001 mg/L	93.8	70.0	130				

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Client : Teck Coal Limited
Project : Regional Effects Program



RG_FBLANK_WS_LAEMP_GC_2022-09_N RG_GAUT_WS_LAEMP_GC_2022-09_N Dissolved metals were field filtered and to be lab preserved ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS Sample ID SERVICE REQUEST (rush - subject to availability) Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS Facility Name / Job# Regional Effects Program Total metals to be lab preserved Project Manager Giovanna Diaz Phone Number 1-250-865-3048 Postal Code V0B 2G0 Priority (2-3 business days) - 50% surcharge X Address 421 Pine Avenue Email Giovanna Diaz@Teck.com City Sparwood PROJECT/CLIENT INFO Sample Location COC ID: RG_FBLANK (sys_loc_code) RG_GAUT SAMPLE DETAILS Regular (default) REP_LAEMP_GC_2022-09_ALS | TURNAROUND TIME: Matrix Field WS WS Country Canada Provinc BC Hazardous Material (Yes/No) Sampler's Signature RELINQUISHED BY/AFFILIATION Sampler's Name 2022/09/14 2022/09/14 Date Jennifer Ings/Minnow Time (24hr) 8:50 8:50 Phone Number 403 407 1794 Postal Code T1Y 7B5 Lab Contact Lyudmyla Shvets Lab Name ALS Calgary C=Com Address 2559 29 Street NE **C** ດ Email Lyudmyla.Shvets@ALSGlobal.com City Calgary Page Cont # Of 7 1 ef Jennifer Ings ANALYSIS PRESERV Filt. ############ LABORATORY DATE/TIME H2SO4 DOC 4 Country Canada Provinc(AB HCI ANALYSIS REQUESTED Mercury_Dissolved HC. Mercury_Total ACCEPTED BY/AFFILIATION 2-3 Business Day 5195003444 PO number Date/Time TECKCOAL_METNHG_D Email 3: Email 6: Email 4: Email 2: Email 5 Email 1: Report Format / Distribution TECKCOAL_METNHG_T Z Giovanna.Diaz@Teck.com X Z TECKCOAL_ROUTINE Lisa.Bowron@minnow.ca Awiebe@minnow.ca X AguaScil.ab@Teck.com H2804 TOC TKN PT z RUSH Priorty VPO00816101 OTHER INFO September 15, 2022 Filtered - F. Field, L. Lab, FL: Field & Lab, N: Non Telephone: +1 403 407 1800 Environmental Division Exce Nork Order Reference CG2212661 PDF EDD **Environmental Division** Calgary
Work Order Reference
CG2212661



CERTIFICATE OF ANALYSIS

Work Order : CG2212819

Client : Teck Coal Limited

Giovanna Diaz Contact

Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone

Project : REGIONAL EFFECTS PROGRAM

: VPO00816101

C-O-C number : REP LAEMP GC 2022-09 ALS

Sampler : Jennifer Ings

Site

Quote number : Teck Coal Master Quote

No. of samples received : 4 No. of samples analysed : 4 Page : 1 of 6

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets Address

: 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800 **Date Samples Received** : 17-Sep-2022 11:38

Date Analysis Commenced : 20-Sep-2022

Issue Date : 22-Sep-2022 17:24

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta	
Dwayne Bennett	Supervisor - Inorganic	Inorganics, Calgary, Alberta	
Dwayne Bennett	Supervisor - Inorganic	Metals, Calgary, Alberta	
Elke Tabora		Inorganics, Calgary, Alberta	
Mackenzie Lamoureux	Laboratory Analyst	Metals, Calgary, Alberta	
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta	
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta	
Sara Niroomand		Inorganics, Calgary, Alberta	
Summie Lo	Lab Assistant	Metals, Calgary, Alberta	
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta	

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 Work Order
 : CG2212819

 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Qualifiers

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
	Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference,
	colour, turbidity).
HTA	Analytical holding time was exceeded.
RRV	Reported result verified by repeat analysis.

>: greater than.

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Work Order : CG2212819
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			C	lient sample ID	RG_GHUT_WS_ LAEMP_GC_20 22-09_N	RG_GHCKD_WS _LAEMP_GC_2 022-09_N	RG_GHDT_WS_ LAEMP_GC_20 22-09_N	RG_TRIP_WS_L AEMP_GC_202 2-09_N	
			Client samp	oling date / time	15-Sep-2022 08:05	15-Sep-2022 13:40	15-Sep-2022 08:55	15-Sep-2022 08:55	
Analyte	CAS Number	Method	LOR	Unit	CG2212819-001	CG2212819-002	CG2212819-003	CG2212819-004	
Physical Tasta					Result	Result	Result	Result	
Physical Tests acidity (as CaCO3)		E283	2.0	mg/L	8.1	<2.0	<2.0	<2.0	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	443	223	308	<1.0	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	540	272	376	<1.0	
alkalinity, carbonate (as CaCO3)	7 1-52-5	E290	1.0	mg/L	<1.0	23.0	20.2	<1.0	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	13.8	12.1	<1.0	
alkalinity, hydroxide (as CaCO3)	3012-32-0	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	
alkalinity, total (as CaCO3)	14200-30-9	E290	1.0	mg/L	443	246	328	<1.0	
conductivity		E100	2.0	μS/cm	2170	1550	1990	<2.0	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	1500	1010	1320	<0.50	
oxidation-reduction potential [ORP]		E125	0.10	mV	377	372	376	469	
pH		E108	0.10	pH units	8.02	8.46	8.38	5.31	
solids, total dissolved [TDS]		E162	10	mg/L	1920	1350	1710	<10	
solids, total suspended [TSS]		E160-L	1.0	mg/L	44.0	1.4	2.0	<1.0	
turbidity		E121	0.10	NTU	33.3 HTA	0.99 HTA	0.14 HTA	<0.10 HTA	
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0132	0.0099	<0.0050	0.0385 RRV	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	<0.250 DLDS	<0.250 DLDS	<0.050	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	1.62	1.55	1.57	<0.10	
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 DLDS	0.136	<0.100 DLDS	<0.020	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.679	<0.500 DLM	<0.500 DLM	<0.050	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	8.94	4.51	8.06	<0.0050	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS	0.0107	<0.0050 DLDS	<0.0010	
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0026 HTA	0.0019 HTA	0.0015 HTA	<0.0010 HTA	
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0321	0.0043	0.0135	<0.0020	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	1110	812	1080	<0.30	
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.59	2.13	1.86		
carbon, total organic [TOC]		E355-L	0.50	mg/L	4.64	2.02	1.79	<0.50	

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Work Order : CG2212819
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_GHUT_WS_ LAEMP_GC_20 22-09_N	RG_GHCKD_WS _LAEMP_GC_2 022-09_N	RG_GHDT_WS_ LAEMP_GC_20 22-09_N	RG_TRIP_WS_L AEMP_GC_202 2-09_N	
				ling date / time	15-Sep-2022 08:05	15-Sep-2022 13:40	15-Sep-2022 08:55	15-Sep-2022 08:55	
Analyte	CAS Number	Method	LOR	Unit	CG2212819-001 Result	CG2212819-002 Result	CG2212819-003 Result	CG2212819-004 Result	
Ion Balance					Result	Nesuit	Result	rvesuit	
anion sum		EC101	0.10	meq/L	32.6	22.2	29.7	<0.10	
cation sum		EC101	0.10	meq/L	30.0	20.4	26.6	<0.10	
ion balance (cations/anions)		EC101	0.010	%	92.0	91.9	89.6	100	
ion balance (APHA)		EC101	0.010	%	4.15	4.22	5.51	<0.010	
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.237	0.0081	0.0044	<0.0030	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00078	0.00042	0.00058	<0.00010	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00036	0.00032	0.00019	<0.00010	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0431	0.0392	0.0354	<0.00010	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.040 DLDS	<0.020	<0.020	<0.020	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000100 DLDS	<0.000050	<0.000050	<0.000050	
boron, total	7440-42-8	E420	0.010	mg/L	<0.020 DLDS	0.011	<0.010	<0.010	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.786	0.0080	0.0073	<0.0050	
calcium, total	7440-70-2	E420	0.050	mg/L	303	159	213	<0.050	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00047	0.00010	<0.00010	<0.00010	
cobalt, total	7440-48-4	E420	0.10	μg/L	0.52	<0.10	<0.10	<0.10	
copper, total	7440-50-8	E420	0.00050	mg/L	0.00200	<0.00050	<0.00050	<0.00050	
iron, total	7439-89-6	E420	0.010	mg/L	0.279	<0.010	<0.010	<0.010	
lead, total	7439-92-1	E420	0.000050	mg/L	0.000604	<0.000050	<0.000050	<0.000050	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0207	0.0168	0.0167	<0.0010	
magnesium, total	7439-95-4	E420	0.0050	mg/L	230	152	208	<0.0050	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0219	0.00192	0.00155	<0.00010	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.000050	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00186	0.00162	0.00154	<0.000050	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0348	0.00795	0.0180	<0.00050	
potassium, total	7440-09-7	E420	0.050	mg/L	3.28	2.52	2.76	<0.050	
selenium, total	7782-49-2	E420	0.050	μg/L	258	148	240	<0.050	
silicon, total	7440-21-3	E420	0.10	mg/L	3.74	3.52	3.44	<0.10	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000020 DLDS	<0.000010	<0.000010	<0.000010	
sodium, total	7440-23-5	E420	0.050	mg/L	1.92	2.62	1.98	<0.050	

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Work Order : CG2212819
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cl	ient sample ID	RG_GHUT_WS_ LAEMP_GC_20	RG_GHCKD_WS _LAEMP_GC_2	RG_GHDT_WS_ LAEMP_GC_20	RG_TRIP_WS_L AEMP_GC_202	
					22-09_N	022-09_N	22-09_N	2-09_N	
			Client samp	ling date / time	15-Sep-2022 08:05	15-Sep-2022 13:40	15-Sep-2022 08:55	15-Sep-2022 08:55	
Analyte	CAS Number	Method	LOR	Unit	CG2212819-001	CG2212819-002	CG2212819-003	CG2212819-004	
					Result	Result	Result	Result	
Total Metals	7440.04.0	E420	0.00020		0.171	0.191	0.161	<0.00020	
strontium, total	7440-24-6			mg/L					
sulfur, total	7704-34-9	E420	0.50	mg/L	434	298	392	<0.50	
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000044	<0.000010	<0.000010	<0.000010	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00020 DLDS	<0.00010	<0.00010	<0.00010	
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00670	<0.00030	<0.00030	<0.00030	
uranium, total	7440-61-1	E420	0.000010	mg/L	0.0142	0.00849	0.0116	<0.000010	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00124	0.00065	<0.00050	<0.00050	
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0450	<0.0030	<0.0030	<0.0030	
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0021	0.0012	0.0033	<0.0010	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00064	0.00042	0.00057	<0.00010	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00022	0.00021	<0.00020 DLDS	<0.00010	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0367	0.0405	0.0376	<0.00010	
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.040 DLDS	<0.020	<0.040 DLDS	<0.020	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000100 DLDS	<0.000050	<0.000100 DLDS	<0.000050	
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.020 DLDS	<0.010	<0.020 DLDS	<0.010	
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	0.580	0.0081	<0.0100 DLDS	<0.0050	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	269	147	213	<0.050	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00020 DLDS	<0.00010	<0.00020 DLDS	<0.00010	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.20 DLDS	<0.10	<0.20 DLDS	<0.10	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00052	0.00030	<0.00040 DLDS	<0.00020	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.020 DLDS	<0.010	<0.020 DLDS	<0.010	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000100 DLDS	<0.000050	<0.000100 DLDS	<0.000050	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0207	0.0154	0.0190	<0.0010	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	200	157	192	<0.0050	
manganese, dissolved	7439-95-4	E421	0.00010	mg/L	0.00900	0.00087	0.00148	<0.00010	
mercury, dissolved	7439-90-5	E509	0.0000050	mg/L	<0.000000	<0.00007	<0.000050		
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00170	0.00159	0.00155	<0.000050	
nickel, dissolved		E421	0.00050		0.0312	0.00139	0.0182	<0.00050	
·	7440-02-0	E421	0.000	mg/L	2.93	2.60	2.68	<0.050	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.93	2.00	2.08	<0.000	

Page : 6 of 6
Work Order : CG2212819
Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			CI	lient sample ID	RG_GHUT_WS_	RG_GHCKD_WS	RG_GHDT_WS_	RG_TRIP_WS_L	
(Matrix: Water)					LAEMP_GC_20 22-09_N	_LAEMP_GC_2 022-09_N	LAEMP_GC_20 22-09_N	AEMP_GC_202 2-09_N	
				ling date / time	15-Sep-2022 08:05	15-Sep-2022 13:40	15-Sep-2022 08:55	15-Sep-2022 08:55	
Analyte	CAS Number	Method	LOR	Unit	CG2212819-001	CG2212819-002	CG2212819-003	CG2212819-004	
					Result	Result	Result	Result	
Dissolved Metals									
selenium, dissolved	7782-49-2	E421	0.050	μg/L	287	173	270	<0.050	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.86	3.46	3.10	<0.050	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000020 DLDS	<0.000010	<0.000020 DLDS	<0.000010	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	1.76	2.59	1.86	<0.050	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.163	0.181	0.168	<0.00020	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	348	285	334	<0.50	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000021	<0.000010	<0.000020 DLDS	<0.000010	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00020 DLDS	<0.00010	<0.00020 DLDS	<0.00010	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00060 DLDS	<0.00030	<0.00060 DLDS	<0.00030	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0124	0.00780	0.0114	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00100 DLDS	<0.00050	<0.00100 DLDS	<0.00050	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0332	<0.0010	<0.0020 DLDS	<0.0010	
dissolved mercury filtration location		EP509	-	-	Field	Field	Field		
dissolved metals filtration location		EP421	-	-	Field	Field	Field	Laboratory	

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



Sparwood BC Canada V0B2G0

QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2212819** Page : 1 of 20

Client : Teck Coal Limited Laboratory : Calgary - Environmental Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets

Address : 421 Pine Avenue Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 17-Sep-2022 11:38

 PO
 : VPO00816101
 Issue Date
 : 22-Sep-2022 17:25

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : Jennifer Ings

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 4
No. of samples analysed : 4

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers: Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



Page : 3 of 20 Work Order : CG2212819

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					Ev	/aluation: 🗴 =	Holding time exce	edance ; 🔻	= Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E298	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E298	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E298	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										,
RG_TRIP_WS_LAEMP_GC_2022-09_N	E298	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)							ı			
HDPE	E235.Br-L	45 0 2000	00.0 0000				20 0 2022	20 4	C -1	√
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.Br-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	∀
Anions and Nutrients : Bromide in Water by IC (Low Level)				I				I		
HDPE RG GHDT WS LAEMP GC 2022-09 N	E235.Br-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
RG_GHD1_WS_LAEMP_GC_2022-09_N	L233.BI-L	13-3ер-2022	20-3ep-2022				20-3ep-2022	20 uays	5 days	•
Anima and Natricates Brownide in Water by 10 (Lovel Lovel)										
Anions and Nutrients : Bromide in Water by IC (Low Level) HDPE										
RG GHUT WS LAEMP GC 2022-09 N	E235.Br-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
1.0_01101_vv0_b1.clvii _00_2022-00_1V		10 COP-2022	20 COP-2022				20 000-2022	20 days	o days	*

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Matrix: Water					Ev	aluation: 🗴 =	Holding time exce	edance ; 🕥	= Within	Holding Ti
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.Br-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.CI-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	√
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E235.CI-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E235.CI-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.CI-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Lo	evel 0.001									
HDPE							1			
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E378-U	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	x EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Lo	evel 0.001									
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E378-U	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	* EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Lo	evel 0.001									
HDPE										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E378-U	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	# EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace L	evel 0.001									
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E378-U	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	* EHT

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Matrix: Water							× = Holding time exceedance ; ✓ = Within Analysis				
Analyte Group	Method	Sampling Date									
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval	
Anions and Nutrients : Fluoride in Water by IC											
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.F	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E235.F	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E235.F	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓	
Anions and Nutrients : Fluoride in Water by IC											
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.F	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.NO3-L	15-Sep-2022	20-Sep-2022	3 days	5 days	* EHT	20-Sep-2022	3 days	0 days	✓	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E235.NO3-L	15-Sep-2022	20-Sep-2022	3 days	5 days	* EHT	20-Sep-2022	3 days	0 days	✓	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E235.NO3-L	15-Sep-2022	20-Sep-2022	3 days	5 days	* EHT	20-Sep-2022	3 days	0 days	✓	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.NO3-L	15-Sep-2022	20-Sep-2022	3 days	5 days	* EHT	20-Sep-2022	3 days	0 days	✓	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.NO2-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	* EHT	

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nalyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)		, ,	Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E235.NO2-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	* EHT
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E235.NO2-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	* EHT
nions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.NO2-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	3 days	5 days	x EHT
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E235.SO4	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E235.SO4	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E235.SO4	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
nions and Nutrients : Sulfate in Water by IC										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E235.SO4	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
nions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low I	_evel)						1			
Amber glass total (sulfuric acid) RG_GHCKD_WS_LAEMP_GC_2022-09_N	E318	15-Sep-2022	21-Sep-2022				21-Sep-2022	28 days	6 days	✓
nions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low l	_evel)									
Amber glass total (sulfuric acid) RG_GHDT_WS_LAEMP_GC_2022-09_N	E318	15-Sep-2022	21-Sep-2022				21-Sep-2022	28 days	6 days	✓

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days

Matrix: Water Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Analyte Group Method Sampling Date Extraction / Preparation Analysis Container / Client Sample ID(s) Preparation Holding Times Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Anions and Nutrients: Total Kjeldahl Nitrogen by Fluorescence (Low Level) Amber glass total (sulfuric acid) E318 15-Sep-2022 21-Sep-2022 21-Sep-2022 28 days 6 days ✓ RG_GHUT_WS_LAEMP_GC_2022-09_N Anions and Nutrients: Total Kjeldahl Nitrogen by Fluorescence (Low Level) Amber glass total (sulfuric acid) ✓ RG_TRIP_WS_LAEMP_GC_2022-09_N E318 15-Sep-2022 21-Sep-2022 21-Sep-2022 28 days 6 days ----Anions and Nutrients: Total Phosphorus by Colourimetry (0.002 mg/L) Amber glass total (sulfuric acid) E372-U 15-Sep-2022 ✓ RG GHCKD WS LAEMP GC 2022-09 N 20-Sep-2022 21-Sep-2022 28 days 6 days Anions and Nutrients: Total Phosphorus by Colourimetry (0.002 mg/L) Amber glass total (sulfuric acid) E372-U RG GHDT WS LAEMP GC 2022-09 N 15-Sep-2022 20-Sep-2022 21-Sep-2022 28 days 6 days ✓ Anions and Nutrients: Total Phosphorus by Colourimetry (0.002 mg/L) Amber glass total (sulfuric acid) E372-U 15-Sep-2022 ✓ RG_GHUT_WS_LAEMP_GC_2022-09_N 20-Sep-2022 21-Sep-2022 28 days 6 days Anions and Nutrients: Total Phosphorus by Colourimetry (0.002 mg/L) Amber glass total (sulfuric acid) E372-U ✓ RG_TRIP_WS_LAEMP_GC_2022-09_N 15-Sep-2022 20-Sep-2022 21-Sep-2022 28 days 6 davs Dissolved Metals: Dissolved Chromium in Water by CRC ICPMS (Low Level) HDPE - dissolved (lab preserved) RG GHCKD WS LAEMP GC 2022-09 N E421.Cr-L 15-Sep-2022 21-Sep-2022 ✓ 21-Sep-2022 6 days 180 days Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level) HDPE - dissolved (lab preserved) E421.Cr-L ✓ RG_GHDT_WS_LAEMP_GC_2022-09_N 15-Sep-2022 21-Sep-2022 21-Sep-2022 6 days 180 days Dissolved Metals: Dissolved Chromium in Water by CRC ICPMS (Low Level) HDPE - dissolved (lab preserved) E421.Cr-L 15-Sep-2022 21-Sep-2022 21-Sep-2022 ✓ RG GHUT WS LAEMP GC 2022-09 N 6 days --------180

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Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE - dissolved (lab preserved)										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E421.Cr-L	15-Sep-2022	21-Sep-2022				21-Sep-2022	180	6 days	✓
								days		
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E509	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E509	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E509	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E421	15-Sep-2022	21-Sep-2022				21-Sep-2022	180	6 days	✓
								days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E421	15-Sep-2022	21-Sep-2022				21-Sep-2022	180	6 days	✓
								days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E421	15-Sep-2022	21-Sep-2022				21-Sep-2022	180	6 days	✓
								days		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E421	15-Sep-2022	21-Sep-2022				21-Sep-2022	180	6 days	✓
								days		
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low	Level)									
Amber glass dissolved (sulfuric acid)										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E358-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓

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Matrix: water	_					alaation.	nolding time exce	oudinoo ,	*******	
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Leve	el)									
Amber glass dissolved (sulfuric acid)										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E358-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Leve	el)									
Amber glass dissolved (sulfuric acid)										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E358-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E355-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E355-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E355-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustic	on (Low Level)									
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E355-L	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Physical Tests : Acidity by Titration									ı	
HDPE	F000	45.0 0000								
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E283	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Acidity by Titration									ı	
HDPE	F000	45 0 2000	00 0 0000				00.0 0000	44	F 4	
RG_GHDT_WS_LAEMP_GC_2022-09_N	E283	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	o days	✓
Physical Tests : Acidity by Titration HDPE							I			
nure										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E283	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 dave	✓

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Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Physical Tests : Acidity by Titration										
HDPE										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E283	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E290	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E290	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_GHUT_WS_LAEMP_GC_2022-09_N	E290	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E290	15-Sep-2022	20-Sep-2022				20-Sep-2022	14 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE	F400	45 0 2000	20 0 2000				20 0 2022	20 4	F -1	,
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E100	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water								I		
HDPE	E100	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	E dovo	✓
RG_GHDT_WS_LAEMP_GC_2022-09_N	L100	13-3ep-2022	20-3ep-2022				20-3ep-2022	20 uays	5 uays	•
Physical Tests : Conductivity in Water										
HDPE RG GHUT WS LAEMP GC 2022-09 N	E100	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	1
110_01101_W0_LALIWIF_00_2022-09_IV	2100	10-06p-2022	20-06p-2022				20-06p-2022	20 days	Juays	•
Dhorical Tasta - Ocudosticita in Mater										
Physical Tests : Conductivity in Water HDPE							I			
RG_TRIP_WS_LAEMP_GC_2022-09_N	E100	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	√
1.0_11.11 _VV0_LALIVII _00_2022-09_IV	L 100	10-00p-2022	20-00p-2022				20-00p-2022	_o days	Judys	•

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Matrix: Water						/aluation: 🗴 =	Holding time excee			Holding Tin
Analyte Group	Method	Sampling Date	Ex	traction / Pre				Analys		
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	7 Times Actual	Eval
Physical Tests : ORP by Electrode										
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E125	15-Sep-2022					20-Sep-2022	0.25 hrs	127 hrs	* EHTR-FN
Physical Tests : ORP by Electrode										
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E125	15-Sep-2022					20-Sep-2022	0.25 hrs	132 hrs	# EHTR-FN
Physical Tests : ORP by Electrode										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E125	15-Sep-2022					20-Sep-2022	0.25 hrs	132 hrs	* EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E125	15-Sep-2022					20-Sep-2022	0.25 hrs	133 hrs	× EHTR-FN
Physical Tests : pH by Meter										
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E108	15-Sep-2022	20-Sep-2022				20-Sep-2022	0.25 hrs	0.28 hrs	EHTR-FN
Physical Tests : pH by Meter										
HDPE RG_GHDT_WS_LAEMP_GC_2022-09_N	E108	15-Sep-2022	20-Sep-2022				20-Sep-2022	0.25 hrs	0.28 hrs	* EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_GHUT_WS_LAEMP_GC_2022-09_N	E108	15-Sep-2022	20-Sep-2022				20-Sep-2022	0.25 hrs	0.28 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N	E108	15-Sep-2022	20-Sep-2022				20-Sep-2022	0.25 hrs	0.28 hrs	EHTR-FN
Physical Tests : TDS by Gravimetry										
HDPE RG_GHCKD_WS_LAEMP_GC_2022-09_N	E162	15-Sep-2022					20-Sep-2022	7 days	5 days	√

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wathx: water					Lv	aluation. * =	Holding time exce	euance , v	_ vvitiiiii	Holding I
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : TDS by Gravimetry										
HDPE										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E162	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE										
RG GHUT WS LAEMP GC 2022-09 N	E162	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
		·					· ·	,		
Physical Tests : TDS by Gravimetry										
HDPE										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E162	15-Sep-2022					20-Sep-2022	7 days	5 days	1
								, -	,-	
Physical Tasks (TOO by One director (Level 1991)										
Physical Tests : TSS by Gravimetry (Low Level) HDPE							I	I		
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E160-L	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
RG_GHCRD_WS_LAEMF_GC_2022-09_N	L 100-L	13-3ер-2022					20-3ep-2022	1 days	Juays	•
Physical Tests : TSS by Gravimetry (Low Level)								I		
HDPE	E160-L	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
RG_GHDT_WS_LAEMP_GC_2022-09_N	E100-L	15-Sep-2022					20-Sep-2022	7 days	5 days	•
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE	E400 I	45.0 0000					00.0 0000	7	5 1	,
RG_GHUT_WS_LAEMP_GC_2022-09_N	E160-L	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE										
RG_TRIP_WS_LAEMP_GC_2022-09_N	E160-L	15-Sep-2022					20-Sep-2022	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_GHCKD_WS_LAEMP_GC_2022-09_N	E121	15-Sep-2022					20-Sep-2022	3 days	5 days	30
										EHT
Physical Tests : Turbidity by Nephelometry										
HDPE										
RG_GHDT_WS_LAEMP_GC_2022-09_N	E121	15-Sep-2022					20-Sep-2022	3 days	5 days	sc
										EHT

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Matrix: Water Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Analyte Group Method Sampling Date Extraction / Preparation Analysis Container / Client Sample ID(s) Preparation Holding Times Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date **Physical Tests: Turbidity by Nephelometry** HDPE E121 15-Sep-2022 20-Sep-2022 3 days RG_GHUT_WS_LAEMP_GC_2022-09_N 5 days æ EHT **Physical Tests: Turbidity by Nephelometry** HDPE RG_TRIP_WS_LAEMP_GC_2022-09_N E121 15-Sep-2022 20-Sep-2022 3 days 5 days æ ----EHT Total Metals: Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) E420.Cr-L 15-Sep-2022 21-Sep-2022 ✓ RG GHCKD WS LAEMP GC 2022-09 N 21-Sep-2022 6 days 180 days Total Metals: Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) E420.Cr-L RG GHDT WS LAEMP GC 2022-09 N 15-Sep-2022 21-Sep-2022 21-Sep-2022 180 6 days ✓ days Total Metals : Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) RG_GHUT_WS_LAEMP_GC_2022-09_N E420.Cr-L 15-Sep-2022 21-Sep-2022 ✓ 21-Sep-2022 6 days 180 days Total Metals : Total Chromium in Water by CRC ICPMS (Low Level) HDPE - total (lab preserved) E420.Cr-L ✓ RG_TRIP_WS_LAEMP_GC_2022-09_N 15-Sep-2022 21-Sep-2022 21-Sep-2022 180 6 days days Total Metals: Total Mercury in Water by CVAAS Glass vial total (hydrochloric acid) RG GHCKD WS LAEMP GC 2022-09 N E508 15-Sep-2022 20-Sep-2022 20-Sep-2022 ✓ 28 days 5 days Total Metals: Total Mercury in Water by CVAAS Glass vial total (hydrochloric acid) ✓ RG_GHDT_WS_LAEMP_GC_2022-09_N E508 15-Sep-2022 20-Sep-2022 20-Sep-2022 28 days 5 days **Total Metals: Total Mercury in Water by CVAAS** Glass vial total (hydrochloric acid) E508 15-Sep-2022 20-Sep-2022 20-Sep-2022 28 days 5 days ✓ RG GHUT WS LAEMP GC 2022-09 N ----

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

Analyte Group	Method	Sampling Date	Extraction / Preparation					Analys	Analysis	
Container / Client Sample ID(s)			Preparation	Holding Times Ev		Eval	Eval Analysis Date	Holding Times		Eval
			Date	Rec	Actual			Rec	Actual	
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) RG_TRIP_WS_LAEMP_GC_2022-09_N	E508	15-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GHCKD_WS_LAEMP_GC_2022-09_N	E420	15-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_GHDT_WS_LAEMP_GC_2022-09_N	E420	15-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS									'	
HDPE - total (lab preserved) RG_GHUT_WS_LAEMP_GC_2022-09_N	E420	15-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) RG_TRIP_WS_LAEMP_GC_2022-09_N	E420	15-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	6 days	✓

Legend & Qualifier Definitions

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

EHT: Exceeded ALS recommended hold time prior to analysis.

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type	C	ount	pecification; ✓ = QC frequency within spec Frequency (%)				
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	656371	1	8	12.5	5.0	1
Alkalinity Species by Titration	E290	656374	1	13	7.6	5.0	√
Ammonia by Fluorescence	E298	656499	1	19	5.2	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	656315	1	4	25.0	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	656316	1	4	25.0	5.0	<u>-</u>
Conductivity in Water	E100	656373	1	13	7.6	5.0	<u>√</u>
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	656675	1	7	14.2	5.0	√
Dissolved Mercury in Water by CVAAS	E509	656310	1	3	33.3	5.0	<u> </u>
Dissolved Metals in Water by CRC ICPMS	E421	656676	1	7	14.2	5.0	1
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	656344	1	10	10.0	5.0	<u> </u>
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	656519	1	20	5.0	5.0	<u>√</u>
Fluoride in Water by IC	E235.F	656314	1	4	25.0	5.0	√
Nitrate in Water by IC (Low Level)	E235.NO3-L	656317	1	4	25.0	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	656318	1	4	25.0	5.0	1
ORP by Electrode	E125	656358	1	12	8.3	5.0	<u> </u>
pH by Meter	E108	656372	1	13	7.6	5.0	√
Sulfate in Water by IC	E235.SO4	656319	1	4	25.0	5.0	1
TDS by Gravimetry	E162	656430	1	13	7.6	5.0	<u> </u>
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	656559	1	9	11.1	5.0	√
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	656243	1	4	25.0	5.0	1
Total Mercury in Water by CVAAS	E508	656309	1	5	20.0	5.0	<u>√</u>
Total Metals in Water by CRC ICPMS	E420	656560	1	9	11.1	5.0	1
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	656345	1	11	9.0	5.0	1
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	656497	1	11	9.0	5.0	√
Turbidity by Nephelometry	E121	656258	1	5	20.0	5.0	1
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	656371	1	8	12.5	5.0	1
Alkalinity Species by Titration	E290	656374	1	13	7.6	5.0	√
Ammonia by Fluorescence	E298	656499	1	19	5.2	5.0	√
Bromide in Water by IC (Low Level)	E235.Br-L	656315	1	4	25.0	5.0	√
Chloride in Water by IC (Low Level)	E235.CI-L	656316	1	4	25.0	5.0	√
Conductivity in Water	E100	656373	1	13	7.6	5.0	√
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	656675	1	7	14.2	5.0	1
Dissolved Mercury in Water by CVAAS	E509	656310	1	3	33.3	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	656676	1	7	14.2	5.0	√
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	656344	1	10	10.0	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	656519	1	20	5.0	5.0	√

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Matrix: Water	<u> </u>	Evaluati	on: × = QC frequ	ency outside spe ount	ecification; ✓ =	QC frequency wit Frequency (%)	· · · · · · · · · · · · · · · · · · ·
Quality Control Sample Type)	
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	656314	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	656317	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	656318	1	4	25.0	5.0	✓
ORP by Electrode	E125	656358	1	12	8.3	5.0	✓
pH by Meter	E108	656372	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	656319	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	656430	1	13	7.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	656559	1	9	11.1	5.0	1
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	656243	1	4	25.0	5.0	√
Total Mercury in Water by CVAAS	E508	656309	1	5	20.0	5.0	1
Total Metals in Water by CRC ICPMS	E420	656560	1	9	11.1	5.0	
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	656345	1	11	9.0	5.0	<u> </u>
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	656497	1	11	9.0	5.0	
TSS by Gravimetry (Low Level)	E160-L	656431	1	16	6.2	5.0	<u> </u>
Turbidity by Nephelometry	E121	656258	1	5	20.0	5.0	
Method Blanks (MB)							-
Acidity by Titration	E283	656371	1	8	12.5	5.0	1
Alkalinity Species by Titration	E290	656374	1	13	7.6	5.0	
Ammonia by Fluorescence	E298	656499	1	19	5.2	5.0	<u> </u>
Bromide in Water by IC (Low Level)	E235.Br-L	656315	1	4	25.0	5.0	
Chloride in Water by IC (Low Level)	E235.CI-L	656316	1	4	25.0	5.0	
Conductivity in Water	E100	656373	1	13	7.6	5.0	
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	656675	1	7	14.2	5.0	<u>√</u>
Dissolved Mercury in Water by CVAAS	E509	656310	1	3	33.3	5.0	
Dissolved Metals in Water by CRC ICPMS	E421	656676	1	7	14.2	5.0	<u>√</u>
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	656344	1	10	10.0	5.0	<u> </u>
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	656519	1	20	5.0	5.0	<u>✓</u>
Fluoride in Water by IC	E235.F	656314	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.F E235.NO3-L	656317	1	4	25.0	5.0	<u>√</u>
Nitrite in Water by IC (Low Level)		656318	1	4	25.0	5.0	
Sulfate in Water by IC	E235.NO2-L E235.SO4	656319	1	4	25.0	5.0	√
TDS by Gravimetry		656430	1	13	7.6	5.0	<u>-</u>
Total Chromium in Water by CRC ICPMS (Low Level)	E162	656559	1	9	11.1	5.0	√
, ,	E420.Cr-L		1	4	25.0	5.0	√
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	656243	1	-			√
Total Mercury in Water by CVAAS	E508	656309	-	5	20.0	5.0	<u>√</u>
Total Metals in Water by CRC ICPMS	E420	656560	1	9	11.1	5.0	<u>√</u>
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	656345	1	11	9.0	5.0	√
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	656497	1	11	9.0	5.0	√
TSS by Gravimetry (Low Level)	E160-L	656431	1	16	6.2	5.0	√
Turbidity by Nephelometry	E121	656258	1	5	20.0	5.0	✓

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

Quality Control Sample Type			Co	Count		Frequency (%,)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	656499	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	656315	1	4	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	656316	1	4	25.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	656675	1	7	14.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	656310	1	3	33.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	656676	1	7	14.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	656344	1	10	10.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	656519	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	656314	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	656317	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	656318	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	656319	1	4	25.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	656559	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	656243	1	4	25.0	5.0	✓
Total Mercury in Water by CVAAS	E508	656309	1	5	20.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	656560	1	9	11.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	656345	1	11	9.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	656497	1	11	9.0	5.0	✓

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is
	Outron Francisco de la			measured by immersion of a conductivity cell with platinum electrodes into a water
all his Matan	Calgary - Environmental	14/-4	ADIIA 4500 II (I)	sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted
	Calgary - Environmental			at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light
, , ,	2121		,	scatter under defined conditions.
	Calgary - Environmental			
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the
	Calmani, Fridania antal			platinum metal-reference electrode employed, measured in mV. For high accuracy test
TOO her Oracina start (Laurel and IV	Calgary - Environmental	14/-4	ADIIA 0540 D (results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the
	Calgary - Environmental			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
				brackish waters) may produce a positive bias by this method. Alternate analysis
				methods are available for these types of samples.
TDS by Gravimetry	E162	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre
				filter, with evaporation of the filtrate at $180 \pm 2^{\circ}\text{C}$ for 16 hours or to constant weight,
Provide to Material (August 1997)	Calgary - Environmental	147.4	EDA 000 4 (with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Chloride in Water by IC (Low Level)	E235.CI-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
			, ,	detection.
	Calgary - Environmental			
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Increasic anions are analyzed by the Chromatography with conductivity and (or 11)/
With the in Water by 10 (Low Level)	EZ33.NOZ-L	vvatei	Li A 500.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
	Calgary - Environmental			decoulor.
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
				detection.
	Calgary - Environmental			
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
	Calgary - Environmental			detection.
Acidity by Titration	E283	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	2200			
	Calgary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Client : Teck Coal Limited



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCI.



QUALITY CONTROL REPORT

Work Order CG2212819

Client : Teck Coal Limited Contact : Giovanna Diaz Address

Sparwood BC Canada V0B2G0

421 Pine Avenue

Telephone

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number :REP LAEMP GC 2022-09 ALS

Sampler : Jennifer Ings

Site

Quote number : Teck Coal Master Quote

No. of samples received : 4 No. of samples analysed : 4 Page : 1 of 18

Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone :+1 403 407 1800

Date Samples Received :17-Sep-2022 11:38 **Date Analysis Commenced**

:20-Sep-2022

: 22-Sep-2022 17:25 Issue Date

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

This Quality Control Report contains the following information:

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Dwayne Bennett	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Dwayne Bennett	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Calgary Metals, Calgary, Alberta
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Vladka Stamenova	Analyst	Calgary Inorganics, Calgary, Alberta

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 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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 : CG2212819

 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC CG2212812-001	Lot: 656258) Anonymous	turbidity		E121	0.10	NTU	0.89	0.89	0.0006	Diff <2x LOR	
Physical Tests (QC	C Lot: 656358)										
CG2212779-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	395	401	1.38%	15%	
Physical Tests (QC CG2212819-001	C_Lot: 656371) RG_GHUT_WS_LAEMP_G C_2022-09_N	acidity (as CaCO3)		E283	2.0	mg/L	8.1	6.4	1.7	Diff <2x LOR	
Physical Tests (QC	Lot: 656372)										
CG2212658-001	Anonymous	pH		E108	0.10	pH units	8.20	8.24	0.487%	4%	
Physical Tests (QC	C Lot: 656373)										
CG2212658-001	Anonymous	conductivity		E100	2.0	μS/cm	514	512	0.390%	10%	
Physical Tests (QC	Lot: 656374)										
CG2212658-001	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	144	142	1.39%	20%	
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	144	142	1.39%	20%	
Physical Tests (QC	Lot: 656430)										
CG2212800-001	Anonymous	solids, total dissolved [TDS]		E162	20	mg/L	440	438	0.569%	20%	
Anions and Nutrien	its (QC Lot: 656243)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	Kjeldahl nitrogen, total [TKN]		E318	0.500	mg/L	0.679	0.732	0.053	Diff <2x LOR	
Anions and Nutrien	its (QC Lot: 656314)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	fluoride	16984-48-8	E235.F	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	
Anions and Nutrien	its (QC Lot: 656315)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	
Anions and Nutrien	its (QC Lot: 656316)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	chloride	16887-00-6	E235.CI-L	0.50	mg/L	1.62	1.61	0.007	Diff <2x LOR	
Anions and Nutrien	its (QC Lot: 656317)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	8.94	8.95	0.0693%	20%	
	its (QC Lot: 656318)										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	

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Work Order : CG2212819
Client : Teck Coal Limited



Anions and Nutrients (OC Lot: 656319) CG221289:001 RDC_PMUT_WE_LAEMT_C CA22289 NO SUBJECT TO SUBJEC	Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Color Colo	Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	_				Qualifier
Anions and Nutrinetts (OC Lot: 666497) CG2212778-001 Anonymous pterspheres, lebal 7728-14-0 2772-14-0 2772-14-0 20000 mg/L 0.8092 0.8096 0.0097 0.0000 0.0007 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000 0.0000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.0000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.0000000 0.000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.00000000		ts (QC Lot: 656319)										
Communication Communicatio	CG2212819-001		sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1110	1120	0.287%	20%	
Anions and Nutrients (QC Lot: 68649) ammonia, total (as N) 7664-11-7 5208 0.0050 mgt 0.0238 0.0222 0.0006 Diff <2x LOR	Anions and Nutrien	ts (QC Lot: 656497)										
Color Colo	CG2212779-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0092	0.0076	0.0017	Diff <2x LOR	
Anions and Nutrients (OC Lot: 656519)	Anions and Nutrien	ts (QC Lot: 656499)										
CG221/2896-001	CG2212779-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0238	0.0232	0.0006	Diff <2x LOR	
Organic / Inorganic Carbon (QC Lot: 656344) Cazzor 2792-2001 Anonymous carbon, dissolved organic [DCc] — E358-L 0.50 mg/L <0.50 <0.50 0 Diff <2x LOR	Anions and Nutrien	ts (QC Lot: 656519)										
Carganic Anonymous Carbon, dissolved organic DOC E388-L 0.50 mg/L < 0.50 c.50 0.0 Diff <2x LOR Carganic Carbon (OC Lot: 656345)	CG2212694-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0015	0.0015	0.00001	Diff <2x LOR	
Carganic Anonymous Carbon, dissolved organic DOC E388-L 0.50 mg/L < 0.50 c.50 0.0 Diff <2x LOR Carganic Carbon (OC Lot: 656345)	Organic / Inorganic	Carbon (QC Lot: 65634	4)									
CG2212879-001					E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
CG2212879-001	Organic / Inorganic	Carbon (QC Lot: 65634	5)									
CG2212819-001		•			E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	
CG2212819-001	Total Metals (QC L	ot: 656309)										
Total Metals (QC Lot: 656559) CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 RG_CHUT_WS_LAEMP_G C_2022-09_N CG2212819-001 C	` '	· · · · · · · · · · · · · · · · · · ·	mercury, total	7439-97-6	E508	0.0000050	mg/L	0.0000075	0.0000055	0.0000020	Diff <2x LOR	
CG2212819-001 RG_GHUT_WS_LAEMP_G	Total Metals (OC L	ot: 656559)	·									
Total Metals (QC Lot: 656560) CG2212819-001 RC_GHUT_WS_LAEMP_G C_2022-09_N antimony, total arsenic, total 7429-90-5 E420 0.00020 mg/L 0.00078 0.00075 0.00003 Diff <2x LOR	the state of the s	RG_GHUT_WS_LAEMP_G	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	0.00047	0.00046	0.000006	Diff <2x LOR	
RG_GHUT_WS_LAEMP_6 C_2022-09_N antimorny, total 7429-90-5 E420 0.00000 mg/L 0.00078 0.00075 0.00003 Diff <2x LOR	Total Metals (QC Lo											
antimony, total arsenic, total arsenic, total arsenic, total arsenic, total barium, total 7440-38-2 E420 0.00020 mg/L 0.00036 0.00041 0.00004 Diff <2x LOR	<u> </u>	RG_GHUT_WS_LAEMP_G	aluminum, total	7429-90-5	E420	0.0060	mg/L	0.237	0.250	5.10%	20%	
barium, total 7440-39-3 E420 0.00020 mg/L 0.0431 0.0439 1.77% 20%		12	antimony, total	7440-36-0	E420	0.00020	mg/L	0.00078	0.00075	0.00003	Diff <2x LOR	
beryllium, total bismuth, total bismuth, total bismuth, total cadmium, total cadmium, total calcium, total cobalt, total copper, total copper, total copper, total control total copper, total cotal			arsenic, total	7440-38-2	E420	0.00020	mg/L	0.00036	0.00041	0.00004	Diff <2x LOR	
bismuth, total 7440-69-9 E420 0.000100 mg/L <0.000100 0 Diff <2x LOR			barium, total	7440-39-3	E420	0.00020	mg/L	0.0431	0.0439	1.77%	20%	
boron, total 7440-42-8 E420 0.020 mg/L <0.020 <0.020 0 Diff <2x LOR			beryllium, total	7440-41-7	E420	0.000040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	
cadmium, total 7440-43-9 E420 0.0000100 mg/L 0.786 μg/L 0.000759 3.47% 20% calcium, total 7440-70-2 E420 0.100 mg/L 303 315 3.75% 20% cobalt, total 7440-48-4 E420 0.00020 mg/L 0.52 μg/L 0.00054 0.00001 Diff <2x LOR			bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
calcium, total 7440-70-2 E420 0.100 mg/L 303 315 3.75% 20% cobalt, total 7440-48-4 E420 0.00020 mg/L 0.52 μg/L 0.00054 0.00001 Diff <2x LOR			boron, total	7440-42-8	E420	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	
cobalt, total 7440-48-4 E420 0.00020 mg/L 0.52 µg/L 0.00054 0.00001 Diff <2x LOR copper, total 7440-50-8 E420 0.00100 mg/L 0.00200 0.00202 0.00002 Diff <2x LOR iron, total 7439-89-6 E420 0.020 mg/L 0.279 0.296 5.89% 20% lead, total 7439-92-1 E420 0.000100 mg/L 0.000604 0.000638 0.00034 Diff <2x LOR lithium, total 7439-93-2 E420 0.0020 mg/L 0.0207 0.0208 0.298% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 230 225 1.91% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00186 0.00192 3.13% 20%			cadmium, total	7440-43-9	E420	0.0000100	mg/L	0.786 μg/L	0.000759	3.47%	20%	
copper, total 7440-50-8 E420 0.00100 mg/L 0.00200 0.00202 0.00002 Diff <2x LOR			calcium, total	7440-70-2	E420	0.100	mg/L	303	315	3.75%	20%	
iron, total 7439-89-6 E420 0.020 mg/L 0.279 0.296 5.89% 20% lead, total 7439-92-1 E420 0.000100 mg/L 0.000604 0.000638 0.000034 Diff <2x LOR lithium, total 7439-93-2 E420 0.0020 mg/L 0.0207 0.0208 0.298% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 230 225 1.91% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.00100 mg/L 0.00186 0.00192 3.13% 20%			cobalt, total	7440-48-4	E420	0.00020	mg/L	0.52 µg/L	0.00054	0.00001	Diff <2x LOR	
lead, total 7439-92-1 E420 0.000100 mg/L 0.000604 0.000638 0.000034 Diff <2x LOR lithium, total 7439-93-2 E420 0.0020 mg/L 0.0207 0.0208 0.298% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 230 225 1.91% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00186 0.00192 3.13% 20%			copper, total	7440-50-8	E420	0.00100	mg/L	0.00200	0.00202	0.00002	Diff <2x LOR	
lead, total 7439-92-1 E420 0.000100 mg/L 0.000604 0.000638 0.000034 Diff <2x LOR				7439-89-6	E420	0.020	mg/L	0.279	0.296	5.89%	20%	
lithium, total 7439-93-2 E420 0.0020 mg/L 0.0207 0.0208 0.298% 20% magnesium, total 7439-95-4 E420 0.0100 mg/L 230 225 1.91% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00186 0.00192 3.13% 20%				7439-92-1	E420	0.000100	mg/L	0.000604	0.000638	0.000034	Diff <2x LOR	
magnesium, total 7439-95-4 E420 0.0100 mg/L 230 225 1.91% 20% manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.00100 mg/L 0.00186 0.00192 3.13% 20%			lithium, total	7439-93-2	E420	0.0020	mg/L	0.0207	0.0208	0.298%	20%	
manganese, total 7439-96-5 E420 0.00020 mg/L 0.0219 0.0216 1.35% 20% molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00186 0.00192 3.13% 20%				7439-95-4	E420	0.0100	mg/L	230	225	1.91%	20%	
molybdenum, total 7439-98-7 E420 0.000100 mg/L 0.00186 0.00192 3.13% 20%					E420	0.00020	-		0.0216		20%	
							-					
			nickel, total	7440-02-0	E420	0.00100	mg/L	0.0348	0.0348	0.160%	20%	

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 Work Order
 : CG2212819

 Client
 : Teck Coal Limited



ub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
otal Metals (QC Lo	ot: 656560) - continued										
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	potassium, total	7440-09-7	E420	0.100	mg/L	3.28	3.29	0.156%	20%	
		selenium, total	7782-49-2	E420	0.000100	mg/L	258 μg/L	0.262	1.58%	20%	
		silicon, total	7440-21-3	E420	0.20	mg/L	3.74	3.82	2.29%	20%	
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	
		sodium, total	7440-23-5	E420	0.100	mg/L	1.92	1.90	0.826%	20%	
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.171	0.182	6.56%	20%	
		sulfur, total	7704-34-9	E420	1.00	mg/L	434	431	0.662%	20%	
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000044	0.000044	0.0000004	Diff <2x LOR	
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		titanium, total	7440-32-6	E420	0.00060	mg/L	0.00670	0.00612	9.12%	20%	
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0142	0.0141	0.484%	20%	
		vanadium, total	7440-62-2	E420	0.00100	mg/L	0.00124	0.00117	0.00007	Diff <2x LOR	
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.0450	0.0450	0.00002	Diff <2x LOR	
issolved Metals (OC Lot: 656310)										
G2212819-001	RG_GHUT_WS_LAEMP_G C 2022-09 N	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.000050	<0.0000050	0	Diff <2x LOR	
issolved Metals (QC Lot: 656675)										
CG2212518-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
issolved Metals (0	QC Lot: 656676)										
CG2212518-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0023	0.0021	0.0002	Diff <2x LOR	
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00143	0.00146	0.00003	Diff <2x LOR	
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0107	0.0111	3.45%	20%	
		beryllium, dissolved	7440-41-7	E421	0.000040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		boron, dissolved	7440-42-8	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	0.0205 μg/L	0.0000179	0.0000026	Diff <2x LOR	
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	349	357	2.30%	20%	
		cobalt, dissolved	7440-48-4	E421	0.00020	mg/L	9.65 µg/L	0.00976	1.13%	20%	
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	
		iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.153	0.148	3.29%	20%	
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	322	321	0.218%	20%	

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Sub-Matrix: Water							Labora	tory Duplicate (DI	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Dissolved Metals (QC Lot: 656676) - con	tinued									
CG2212518-001	Anonymous	molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.0130	0.0131	0.616%	20%	
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.0915	0.0929	1.50%	20%	
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	6.18	6.23	0.705%	20%	
		selenium, dissolved	7782-49-2	E421	0.000100	mg/L	249 µg/L	0.262	4.95%	20%	
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	1.25	1.26	1.24%	20%	
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	
		sodium, dissolved	7440-23-5	E421	0.100	mg/L	1.56	1.56	0.0937%	20%	
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.166	0.169	2.15%	20%	
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	601	609	1.37%	20%	
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000034	0.000037	0.000003	Diff <2x LOR	
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0127	0.0127	0.137%	20%	
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	

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Method Blank (MB) Report

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

Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 656258)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 656371)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 656373)					
conductivity	E100	1	μS/cm	1.4	
Physical Tests (QCLot: 656374)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 656430)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Physical Tests (QCLot: 656431)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Anions and Nutrients (QCLot: 656243)					
Kjeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 656314)					
fluoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 656315)					
bromide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 656316)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 656317)					
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 656318)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 656319)					
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 656497)					
phosphorus, total	7723-14-0 E372-U	0.002	mg/L	<0.0020	
Anions and Nutrients (QCLot: 656499)					
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 656519)					

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Analyta	CAS Number Method	LOR	Unit	Dogl4	Qualifier
Analyte Anions and Nutrients (QCLot: 656519)		LOR	Oilit	Result	Quannel
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Organic / Inorganic Carbon (QCLot: 6			3		
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	<0.50	
Organic / Inorganic Carbon (QCLot: 6					
carbon, total organic [TOC]	E355-L	0.5	mg/L	<0.50	
Total Metals (QCLot: 656309)					
mercury, total	7439-97-6 E508	0.000005	mg/L	<0.000050	
Total Metals (QCLot: 656559)			-		
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	<0.00010	
Total Metals (QCLot: 656560)					
aluminum, total	7429-90-5 E420	0.003	mg/L	<0.0030	
antimony, total	7440-36-0 E420	0.0001	mg/L	<0.00010	
arsenic, total	7440-38-2 E420	0.0001	mg/L	<0.00010	
barium, total	7440-39-3 E420	0.0001	mg/L	<0.00010	
beryllium, total	7440-41-7 E420	0.00002	mg/L	<0.000020	
bismuth, total	7440-69-9 E420	0.00005	mg/L	<0.000050	
boron, total	7440-42-8 E420	0.01	mg/L	<0.010	
cadmium, total	7440-43-9 E420	0.000005	mg/L	<0.000050	
calcium, total	7440-70-2 E420	0.05	mg/L	<0.050	
cobalt, total	7440-48-4 E420	0.0001	mg/L	<0.00010	
copper, total	7440-50-8 E420	0.0005	mg/L	<0.00050	
iron, total	7439-89-6 E420	0.01	mg/L	<0.010	
lead, total	7439-92-1 E420	0.00005	mg/L	<0.000050	
lithium, total	7439-93-2 E420	0.001	mg/L	<0.0010	
magnesium, total	7439-95-4 E420	0.005	mg/L	<0.0050	
manganese, total	7439-96-5 E420	0.0001	mg/L	<0.00010	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	<0.000050	
nickel, total	7440-02-0 E420	0.0005	mg/L	<0.00050	
potassium, total	7440-09-7 E420	0.05	mg/L	<0.050	
selenium, total	7782-49-2 E420	0.00005	mg/L	<0.000050	
silicon, total	7440-21-3 E420	0.1	mg/L	<0.10	
silver, total	7440-22-4 E420	0.00001	mg/L	<0.000010	
sodium, total	7440-23-5 E420	0.05	mg/L	<0.050	
strontium, total	7440-24-6 E420	0.0002	mg/L	<0.00020	
sulfur, total	7704-34-9 E420	0.5	mg/L	<0.50	
thallium, total	7440-28-0 E420	0.00001	mg/L	<0.000010	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 656560) - continue	d				
in, total	7440-31-5 E420	0.0001	mg/L	<0.00010	
itanium, total	7440-32-6 E420	0.0003	mg/L	<0.00030	
ıranium, total	7440-61-1 E420	0.00001	mg/L	<0.000010	
ranadium, total	7440-62-2 E420	0.0005	mg/L	<0.00050	
tinc, total	7440-66-6 E420	0.003	mg/L	<0.0030	
Dissolved Metals (QCLot: 656310)					
nercury, dissolved	7439-97-6 E509	0.000005	mg/L	<0.000050	
Dissolved Metals (QCLot: 656675)					
chromium, dissolved	7440-47-3 E421.Cr-L	0.0001	mg/L	<0.00010	
Dissolved Metals (QCLot: 656676)					
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	<0.0010	
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	<0.00010	
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	<0.00010	
parium, dissolved	7440-39-3 E421	0.0001	mg/L	<0.00010	
peryllium, dissolved	7440-41-7 E421	0.00002	mg/L	<0.000020	
sismuth, dissolved	7440-69-9 E421	0.00005	mg/L	<0.000050	
oron, dissolved	7440-42-8 E421	0.01	mg/L	<0.010	
admium, dissolved	7440-43-9 E421	0.000005	mg/L	<0.0000050	
alcium, dissolved	7440-70-2 E421	0.05	mg/L	<0.050	
obalt, dissolved	7440-48-4 E421	0.0001	mg/L	<0.00010	
copper, dissolved	7440-50-8 E421	0.0002	mg/L	<0.00020	
ron, dissolved	7439-89-6 E421	0.01	mg/L	<0.010	
ead, dissolved	7439-92-1 E421	0.00005	mg/L	<0.000050	
thium, dissolved	7439-93-2 E421	0.001	mg/L	<0.0010	
nagnesium, dissolved	7439-95-4 E421	0.005	mg/L	<0.0050	
nanganese, dissolved	7439-96-5 E421	0.0001	mg/L	<0.00010	
nolybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	<0.000050	
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	<0.00050	
ootassium, dissolved	7440-09-7 E421	0.05	mg/L	<0.050	
elenium, dissolved	7782-49-2 E421	0.00005	mg/L	<0.000050	
ilicon, dissolved	7440-21-3 E421	0.05	mg/L	<0.050	
ilver, dissolved	7440-22-4 E421	0.00001	mg/L	<0.000010	
sodium, dissolved	7440-23-5 E421	0.05	mg/L	<0.050	
strontium, dissolved	7440-24-6 E421	0.0002	mg/L	<0.00020	
sulfur, dissolved	7704-34-9 E421	0.5	mg/L	<0.50	
hallium, dissolved	7440-28-0 E421	0.00001	mg/L	<0.000010	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 656676) - c	continued					
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water					Laboratory Con	ntrol Sample (LCS)	Report	
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 656258)								
turbidity	E121	0.1	NTU	200 NTU	104	85.0	115	
Physical Tests (QCLot: 656358)								
oxidation-reduction potential [ORP]	E125		mV	220 mV	99.4	95.4	104	
Physical Tests (QCLot: 656371)								
acidity (as CaCO3)	E283	2	mg/L	50 mg/L	106	85.0	115	
Physical Tests (QCLot: 656372)								
	E108		pH units	7 pH units	101	98.6	101	
Physical Tests (QCLot: 656373)								
	E100	1	μS/cm	146.9 μS/cm	98.8	90.0	110	
Physical Tests (QCLot: 656374)								
	E290	1	mg/L	500 mg/L	103	85.0	115	
Physical Tests (QCLot: 656430)								
	E162	10	mg/L	1000 mg/L	95.5	85.0	115	
Physical Tests (QCLot: 656431)								
	E160-L	1	mg/L	150 mg/L	93.3	85.0	115	
				-				
Anions and Nutrients (QCLot: 656243)								
	E318	0.05	mg/L	4 mg/L	103	75.0	125	
Anions and Nutrients (QCLot: 656314)								
fluoride 16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 656315)								
bromide 24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	97.2	85.0	115	
Anions and Nutrients (QCLot: 656316)								
chloride (QCLOt. 656516)	E235.CI-L	0.1	mg/L	100 mg/L	99.2	90.0	110	
Anions and Nutrients (QCLot: 656317)								1
	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.8	90.0	110	
Anions and Nutrients (QCLot: 656318)					22.5			
	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	
			<u> </u>	3.5g, 2				
Anions and Nutrients (QCLot: 656319) sulfate (as SO4) 14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	
		0.0	9, =	100 Hig/L	102	33.3		
Anions and Nutrients (QCLot: 656497) phosphorus, total 7723-14-0	F372-U	0.002	mg/L	0.03 mg/L	102	80.0	120	
		0.002	9/ ⊑	0.03 Hg/L	102	55.0	120	
Anions and Nutrients (QCLot: 656499)								

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Sub-Matrix: Water					Laboratory Co	ntrol Sample (LCS)	Report	
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifie
Anions and Nutrients (QCLot: 656499) - c	continued							
ammonia, total (as N)	7664-41-7 E298	0.005	mg/L	0.2 mg/L	104	85.0	115	
Anions and Nutrients (QCLot: 656519)								
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	0.03 mg/L	102	80.0	120	
Organic / Inorganic Carbon (QCLot: 6563	344)							
carbon, dissolved organic [DOC]	E358-L	0.5	mg/L	8.57 mg/L	100	80.0	120	
Organic / Inorganic Carbon (QCLot: 6563	345)							
carbon, total organic [TOC]	E355-L	0.5	mg/L	8.57 mg/L	101	80.0	120	
Total Metals (QCLot: 656309)								
mercury, total	7439-97-6 E508	0.000005	mg/L	0.0001 mg/L	113	80.0	120	
Total Metals (QCLot: 656559)								
chromium, total	7440-47-3 E420.Cr-L	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	
Total Metals (QCLot: 656560)								
aluminum, total	7429-90-5 E420	0.003	mg/L	2 mg/L	104	80.0	120	
antimony, total	7440-36-0 E420	0.0001	mg/L	1 mg/L	100	80.0	120	
arsenic, total	7440-38-2 E420	0.0001	mg/L	1 mg/L	97.2	80.0	120	
oarium, total	7440-39-3 E420	0.0001	mg/L	0.25 mg/L	94.4	80.0	120	
beryllium, total	7440-41-7 E420	0.00002	mg/L	0.1 mg/L	95.8	80.0	120	
pismuth, total	7440-69-9 E420	0.00005	mg/L	1 mg/L	95.0	80.0	120	
ooron, total	7440-42-8 E420	0.01	mg/L	1 mg/L	99.5	80.0	120	
cadmium, total	7440-43-9 E420	0.000005	mg/L	0.1 mg/L	94.6	80.0	120	
calcium, total	7440-70-2 E420	0.05	mg/L	50 mg/L	93.3	80.0	120	
cobalt, total	7440-48-4 E420	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	
copper, total	7440-50-8 E420	0.0005	mg/L	0.25 mg/L	96.3	80.0	120	
iron, total	7439-89-6 E420	0.01	mg/L	1 mg/L	95.2	80.0	120	
ead, total	7439-92-1 E420	0.00005	mg/L	0.5 mg/L	94.3	80.0	120	
ithium, total	7439-93-2 E420	0.001	mg/L	0.25 mg/L	88.8	80.0	120	
nagnesium, total	7439-95-4 E420	0.005	mg/L	50 mg/L	108	80.0	120	
manganese, total	7439-96-5 E420	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	
molybdenum, total	7439-98-7 E420	0.00005	mg/L	0.25 mg/L	97.6	80.0	120	
nickel, total	7440-02-0 E420	0.0005	mg/L	0.5 mg/L	95.2	80.0	120	
potassium, total	7440-09-7 E420	0.05	mg/L	50 mg/L	104	80.0	120	
selenium, total	7782-49-2 E420	0.00005	mg/L	1 mg/L	91.6	80.0	120	
silicon, total	7440-21-3 E420	0.1	mg/L	10 mg/L	102	60.0	140	
silver, total	7440-22-4 E420	0.00001	mg/L	0.1 mg/L	93.4	80.0	120	
sodium, total	7440-23-5 E420	0.05	mg/L	50 mg/L	103	80.0	120	

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Sub-Matrix: Water						Laboratory Co	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 656560) - continu	ıed								
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	90.4	80.0	120	
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	109	0.08	120	
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	92.6	80.0	120	
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.4	80.0	120	
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	92.2	80.0	120	
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	92.0	80.0	120	
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	96.7	80.0	120	
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	93.8	80.0	120	
Dissolved Metals (QCLot: 656675)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	102	0.08	120	
Dissolved Metals (QCLot: 656676)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	108	80.0	120	
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	100	80.0	120	
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	100	80.0	120	
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.3	80.0	120	
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.5	80.0	120	
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	108	80.0	120	
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	108	80.0	120	
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	80.0	120	
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.2	80.0	120	
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	60.0	140	
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	90.5	80.0	120	
sodium, dissolved	7440-23-5		0.05	mg/L	50 mg/L	105	80.0	120	
strontium, dissolved	7440-24-6		0.0002	mg/L	0.25 mg/L	104	80.0	120	
			- · · · · -	3	0.20 mg/L	10-1		1	

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Sub-Matrix: Water						Laboratory Co	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 656676) - continu	ued								
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	86.8	80.0	120	
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.9	80.0	120	
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	103	80.0	120	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	104	80.0	120	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.8	80.0	120	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	106	80.0	120	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.0	80.0	120	

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: Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

Sub-Matrix: Water							Matrix Spik	re (MS) Report		
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	ients (QCLot: 656243)									
CG2212819-002	RG_GHCKD_WS_LAEMP_ GC_2022-09_N	Kjeldahl nitrogen, total [TKN]		E318	2.60 mg/L	2.5 mg/L	104	70.0	130	
Anions and Nutri	ients (QCLot: 656314)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	fluoride	16984-48-8	E235.F	1.11 mg/L	1 mg/L	111	75.0	125	
Anions and Nutri	ients (QCLot: 656315)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	bromide	24959-67-9	E235.Br-L	0.495 mg/L	0.5 mg/L	99.0	75.0	125	
Anions and Nutri	ients (QCLot: 656316)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	chloride	16887-00-6	E235.CI-L	111 mg/L	100 mg/L	111	75.0	125	
Anions and Nutri	ients (QCLot: 656317)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	nitrate (as N)	14797-55-8	E235.NO3-L	2.77 mg/L	2.5 mg/L	111	75.0	125	
Anions and Nutri	ients (QCLot: 656318)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	nitrite (as N)	14797-65-0	E235.NO2-L	0.566 mg/L	0.5 mg/L	113	75.0	125	
Anions and Nutri	ients (QCLot: 656319)									
CG2212819-004	RG_TRIP_WS_LAEMP_GC _2022-09_N	sulfate (as SO4)	14808-79-8	E235.SO4	106 mg/L	100 mg/L	106	75.0	125	
Anions and Nutri	ients (QCLot: 656497)									
CG2212818-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0448 mg/L	0.05 mg/L	89.6	70.0	130	
Anions and Nutri	ients (QCLot: 656499)									
CG2212792-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.112 mg/L	0.1 mg/L	112	75.0	125	
Anions and Nutri	ients (QCLot: 656519)									
CG2212694-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0525 mg/L	0.05 mg/L	105	70.0	130	
Organic / Inorga	nic Carbon (QCLot: 656	344)								
CG2212792-001	Anonymous	carbon, dissolved organic [DOC]		E358-L	4.78 mg/L	5 mg/L	95.6	70.0	130	
Organic / Inorga	nic Carbon (QCLot: 656	345)								
CG2212792-001	Anonymous	carbon, total organic [TOC]		E355-L	5.20 mg/L	5 mg/L	104	70.0	130	
Total Metals (QC	Lot: 656309)									
CG2212819-001	RG_GHUT_WS_LAEMP_G C_2022-09_N	mercury, total	7439-97-6	E508	0.0000956 mg/L	0.0001 mg/L	95.6	70.0	130	

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ub-Matrix: Water							Matrix Spik	re (MS) Report		
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
aboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie
otal Metals (QC	Lot: 656559)									
CG2212819-002	RG_GHCKD_WS_LAEMP_ GC_2022-09_N	chromium, total	7440-47-3	E420.Cr-L	0.420 mg/L	0.4 mg/L	105	70.0	130	
otal Metals (QC	Lot: 656560)									
CG2212819-002	RG_GHCKD_WS_LAEMP_	aluminum, total	7429-90-5	E420	2.12 mg/L	2 mg/L	106	70.0	130	
	GC_2022-09_N	antimony, total	7440-36-0	E420	0.230 mg/L	0.2 mg/L	115	70.0	130	
		arsenic, total	7440-38-2	E420	0.209 mg/L	0.2 mg/L	104	70.0	130	
		barium, total	7440-39-3	E420	0.200 mg/L	0.2 mg/L	99.8	70.0	130	
		beryllium, total	7440-41-7	E420	0.410 mg/L	0.4 mg/L	103	70.0	130	
		bismuth, total	7440-69-9	E420	0.116 mg/L	0.1 mg/L	116	70.0	130	
		boron, total	7440-42-8	E420	1.10 mg/L	1 mg/L	110	70.0	130	
		cadmium, total	7440-43-9	E420	0.0421 mg/L	0.04 mg/L	105	70.0	130	
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, total	7440-48-4	E420	0.213 mg/L	0.2 mg/L	106	70.0	130	
		copper, total	7440-50-8	E420	0.211 mg/L	0.2 mg/L	105	70.0	130	
		iron, total	7439-89-6	E420	21.2 mg/L	20 mg/L	106	70.0	130	
		lead, total	7439-92-1	E420	0.243 mg/L	0.2 mg/L	121	70.0	130	
		lithium, total	7439-93-2	E420	1.02 mg/L	1 mg/L	102	70.0	130	
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, total	7439-96-5	E420	0.222 mg/L	0.2 mg/L	111	70.0	130	
		molybdenum, total	7439-98-7	E420	0.211 mg/L	0.2 mg/L	106	70.0	130	
		nickel, total	7440-02-0	E420	0.418 mg/L	0.4 mg/L	104	70.0	130	
		potassium, total	7440-09-7	E420	43.9 mg/L	40 mg/L	110	70.0	130	
		selenium, total	7782-49-2	E420	0.425 mg/L	0.4 mg/L	106	70.0	130	
		silicon, total	7440-21-3	E420	118 mg/L	100 mg/L	118	70.0	130	
		silver, total	7440-22-4	E420	0.0433 mg/L	0.04 mg/L	108	70.0	130	
		sodium, total	7440-23-5	E420	21.0 mg/L	20 mg/L	105	70.0	130	
		strontium, total	7440-24-6	E420	0.235 mg/L	0.2 mg/L	118	70.0	130	
		sulfur, total	7704-34-9	E420	ND mg/L	200 mg/L	ND	70.0	130	
		thallium, total	7440-28-0	E420	0.0408 mg/L	0.04 mg/L	102	70.0	130	
		tin, total	7440-31-5	E420	0.211 mg/L	0.2 mg/L	106	70.0	130	
		titanium, total	7440-32-6	E420	0.441 mg/L	0.4 mg/L	110	70.0	130	
		uranium, total	7440-61-1	E420	0.0400 mg/L	0.04 mg/L	100	70.0	130	
		vanadium, total	7440-62-2	E420	1.06 mg/L	1 mg/L	106	70.0	130	
		zinc, total	7440-66-6	E420	4.10 mg/L	4 mg/L	103	70.0	130	
ssolved Metals	(QCLot: 656310)									
G2212819-002	RG_GHCKD_WS_LAEMP_ GC 2022-09 N	mercury, dissolved	7439-97-6	E509	0.000109 mg/L	0.0001 mg/L	109	70.0	130	

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Sub-Matrix: Water							Matrix Spik	re (MS) Report		
					Spi	ike	Recovery (%)	Recovery	Limits (%)	
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals	(QCLot: 656675)									
CG2212818-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.393 mg/L	0.4 mg/L	98.3	70.0	130	
Dissolved Metals	(QCLot: 656676)									
CG2212818-001	Anonymous	aluminum, dissolved	7429-90-5	E421	1.89 mg/L	2 mg/L	94.6	70.0	130	
		antimony, dissolved	7440-36-0	E421	0.195 mg/L	0.2 mg/L	97.5	70.0	130	
		arsenic, dissolved	7440-38-2	E421	0.196 mg/L	0.2 mg/L	97.9	70.0	130	
		barium, dissolved	7440-39-3	E421	0.198 mg/L	0.2 mg/L	99.1	70.0	130	
		beryllium, dissolved	7440-41-7	E421	0.352 mg/L	0.4 mg/L	88.0	70.0	130	
		bismuth, dissolved	7440-69-9	E421	0.0934 mg/L	0.1 mg/L	93.4	70.0	130	
		boron, dissolved	7440-42-8	E421	0.903 mg/L	1 mg/L	90.3	70.0	130	
		cadmium, dissolved	7440-43-9	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	
		cobalt, dissolved	7440-48-4	E421	0.198 mg/L	0.2 mg/L	98.9	70.0	130	
		copper, dissolved	7440-50-8	E421	0.194 mg/L	0.2 mg/L	97.0	70.0	130	
		iron, dissolved	7439-89-6	E421	20.0 mg/L	20 mg/L	100	70.0	130	
		lead, dissolved	7439-92-1	E421	0.199 mg/L	0.2 mg/L	99.4	70.0	130	
		lithium, dissolved	7439-93-2	E421	0.934 mg/L	1 mg/L	93.4	70.0	130	
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	
		manganese, dissolved	7439-96-5	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	
		molybdenum, dissolved	7439-98-7	E421	0.203 mg/L	0.2 mg/L	101	70.0	130	
		nickel, dissolved	7440-02-0	E421	0.404 mg/L	0.4 mg/L	101	70.0	130	
		potassium, dissolved	7440-09-7	E421	38.6 mg/L	40 mg/L	96.6	70.0	130	
		selenium, dissolved	7782-49-2	E421	0.416 mg/L	0.4 mg/L	104	70.0	130	
		silicon, dissolved	7440-21-3	E421	90.9 mg/L	100 mg/L	90.9	70.0	130	
		silver, dissolved	7440-22-4	E421	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	
		sodium, dissolved	7440-23-5	E421	19.7 mg/L	20 mg/L	98.7	70.0	130	
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130	
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	
		thallium, dissolved	7440-28-0	E421	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	
		tin, dissolved	7440-31-5	E421	0.193 mg/L	0.2 mg/L	96.5	70.0	130	
		titanium, dissolved	7440-32-6	E421	0.410 mg/L	0.4 mg/L	102	70.0	130	
		uranium, dissolved	7440-61-1	E421	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	
		vanadium, dissolved	7440-62-2	E421	1.01 mg/L	1 mg/L	101	70.0	130	
		zinc, dissolved	7440-66-6	E421	3.76 mg/L	4 mg/L	94.1	70.0	130	

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	5195003444	Jennifer ings		4				
DG-17 25 11380000	\$ 1 × 1		_	Vame	Sampler's Name	default)	Regular (default) Priority (2-3 business days) - 50% surcharge	Priority (2-
DATECTIME 1138 AU 2011 1138 AU 2011 2	Series Constitution						subject to availability)	SERVICE REQUEST (rush - subject to availability)
DATE/IME	Series C							
DATECTIME						·		
DATETIME	0 0 2 0			Achinita ragaritation	Thursday	- 2	ab preserved	DISSOIVED metals were near the lab preserved
	ACCEPTED BY/AFFILIATION	DATE/TIME	FILIATION	RELINQUISHED BY/AFFILIATION	RELINQUIS		ECIAL INSTRUCTIONS	ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS
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1	1 1	1	G 7	6 8:55	2022/09/16	ws ,	RG_GHDT	RG_GHDT_WS_LAEMP_GC_2022-09_N 9
	1	1	*G : 7	5 13;40	2022/09/15	ws	RG_GHCKD	RG_GHCKD_WS_LAEMP_GC_2022-09_N 4
1		-	,G 7	5 8:05	2022/09/15	ws	RG_GHUT	RG_GHUT_WS_LAEMP_GC_2022-09_N
TECKCOAL_ROUTIN	Mercury_Total TECKCOAL_METNH TECKCOAL_METNH	DOC Mercury_Dissolved	G=Grab C=Com # Of	Time (24hr)	Hazardous Material (Y ਹੈ ਹੈ ਹੋਵੇਂ	Marie de la Company de la Comp	Sample Location (sys loc code)	Telephone: +1 403 407 1800
NE H299		PRES		*	05/1NU)	*		Calgary Work Order Reference CG2212819
	T N	F F		***				Environmental Division
Filtered - F: Field, L. Lab, Fl.: Rield & Lab	ANALYSIS REQUESTED	ANALYS		-		DETAILS	PLE	
10101	PO number		Phone Number 403 407 1794	Phon			1-250-865-3048	Phone Number 1-250-865-3048
<u> </u>	ada Email 6:	35 Country Canada	Postal Code T1Y 7B5	Pc	Country Canada	Cor	V0B 2G0	Postal Code V0B 2G0
x	Email 5;	Provinc AB	City Calgary		Provinc BC	Pro Pro	City Sparwood	City
Lisa Bowron@minnow ca X X X	Email 4.					*		1000
v v	Email 3:	2559 29 Street NE	Address 2559 29	•	*	. 6 //**	Address 421 Pine Avenue	Address
AquaScit,ab@Teck.com X X X	Email 1:	yla Shvets		7			Giovanna Diaz	Project Manager Giovanna Diaz
Report Format / Distribution Excel PDF ED	Report For	algary	Lab Name ALS Calgary	-			Facility Name / Job# Regional Effects Program	Facility Name / Job#
OTHER INFO	2-3 Business Days	LABORATORY	LABOR				PROJECT/CLIENT INFO	

Calgary
Work Order Reference



CERTIFICATE OF ANALYSIS

Page **Work Order** : CG2213024 : 1 of 7

: 2 Amendment

Client : Teck Coal Limited Laboratory : Calgary - Environmental Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Date Samples Received **Project** : REGIONAL EFFECTS PROGRAM : 22-Sep-2022 08:58

PO : VPO00816101

C-O-C number : GHO RAEMP 2022-09 ALS

Sampler : Jennifer Ings Site

Quote number : Teck Coal Master Quote

No. of samples received : 1 No. of samples analysed : 1

Address : 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800

Date Analysis Commenced : 22-Sep-2022

Issue Date : 12-Oct-2022 16:00

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

Telephone

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Metals, Calgary, Alberta
Kevin Baxter		Metals, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Metals, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sara Niroomand		Metals, Calgary, Alberta
Sheida Aria	Lab Assistant	Metals, Calgary, Alberta
Shirley Li		Metals, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta



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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

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

<: less than.

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

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

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

Qualifiers

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical
	Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference,
	colour, turbidity).
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to
	signal enhancement from volatile selenium species. Contact ALS if an alternative test
	to address this interference is needed.
HTA	Analytical holding time was exceeded.

>: greater than.

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			Ci	lient sample ID	RG_GHP_WS_L	 	
(Matrix: Water)					AEMP_GC_202 2-09_N		
			Client samp	oling date / time	19-Sep-2022 09:15	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213024-001	 	
Physical Tests					Result	 	
acidity (as CaCO3)		E283	2.0	mg/L	<2.0	 	
alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	243	 	
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	296	 	
alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	10.2	 	
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	6.1	 	
alkalinity, hydroxide (as CaCO3)	3012-32-0	E290	1.0	mg/L	<1.0	 	
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	 	
alkalinity, total (as CaCO3)	14200-30-3	E290	1.0	mg/L	253	 	
conductivity		E100	2.0	μS/cm	1580	 	
hardness (as CaCO3), dissolved		EC100	0.50	mg/L	1190	 	
oxidation-reduction potential [ORP]		E125	0.10	mV	363	 	
pH		E108	0.10	pH units	8.32	 	
solids, total dissolved [TDS]		E162	10	mg/L	1320	 	
solids, total suspended [TSS]		E160-L	1.0	mg/L	3.4	 	
turbidity		E121	0.10	NTU	1.22	 	
•		E121	0.10	1110	1.22		
Anions and Nutrients ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0088	 	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	 	
chloride	16887-00-6	E235.CI-L	0.10	mg/L	1.51	 	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.146	 	
Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	<0.500 DLM	 	
nitrate (as N)	 14797-55-8	E235.NO3-L	0.0050	mg/L	4.65	 	
nitrite (as N)		E235.NO2-L	0.0030	_	0.0110	 	
phosphate, ortho-, dissolved (as P)	14797-65-0 14265-44-2	E378-U	0.0010	mg/L mg/L	0.0018 HTA	 	
phosphorus, total		E376-U E372-U	0.0010		0.0018	 	
sulfate (as SO4)	7723-14-0	E235.SO4	0.0020	mg/L	846	 	
· ,	14808-79-8	L200.304	0.30	mg/L	040	 	
Organic / Inorganic Carbon carbon, dissolved organic [DOC]		E358-L	0.50	mg/l	1.44	 	
carbon, total organic [DOC]		E355-L	0.50	mg/L	1.47		
carbon, total organic [100]		E333-L	0.50	mg/L	1.47	 	

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			Cli	ient sample ID	RG_GHP_WS_L AEMP_GC_202 2-09_N	 	
			Client samp	ling date / time	19-Sep-2022 09:15	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213024-001	 	
					Result	 	
Metals							
selenium, dissolved	7782-49-2	E423ASe	0.050	μg/L	159	 	
Ion Balance							
anion sum		EC101	0.10	meq/L	23.0	 	
cation sum		EC101	0.10	meq/L	24.0	 	
ion balance (cations/anions)		EC101	0.010	%	104	 	
ion balance (APHA)		EC101	0.010	%	2.13	 	
Total Metals							
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0136	 	
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00048	 	
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00029	 	
barium, total	7440-39-3	E420	0.00010	mg/L	0.0460	 	
beryllium, total	7440-41-7	E420	0.020	μg/L	<0.020	 	
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	 	
boron, total	7440-42-8	E420	0.010	mg/L	0.012	 	
cadmium, total	7440-43-9	E420	0.0050	μg/L	0.0120	 	
calcium, total	7440-70-2	E420	0.050	mg/L	166	 	
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00011	 	
cobalt, total	7440-48-4	E420	0.10	μg/L	<0.10	 	
copper, total	7440-50-8	E420	0.00050	mg/L	0.00051	 	
iron, total	7439-89-6	E420	0.010	mg/L	0.010	 	
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	 	
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0199	 	
magnesium, total	7439-95-4	E420	0.0050	mg/L	168	 	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00331	 	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	 	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00165	 	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00900	 	
potassium, total	7440-09-7	E420	0.050	mg/L	2.56	 	
selenium, total	7782-49-2	E420	0.050	μg/L	156 DTSE	 	
silicon, total	7440-21-3	E420	0.10	mg/L	3.57	 	

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water			Cli	ent sample ID	RG_GHP_WS_L	 		
(Matrix: Water)					AEMP_GC_202 2-09_N			
			Client sampl	ing date / time	19-Sep-2022 09:15	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213024-001	 		
Total Matela					Result	 		
Total Metals silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	 		
sodium, total	7440-23-5	E420	0.050	mg/L	2.74	 		
strontium, total	7440-24-6	E420	0.00020	mg/L	0.202	 		
sulfur, total	7704-34-9	E420	0.50	mg/L	265	 		
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	 		
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	 		
titanium, total	7440-31-5	E420	0.00030	mg/L	0.00047	 		
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00835	 		
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	 		
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	 		
Dissolved Metals	7440-00-0	2.20	0.0000	mg/L	0.000			
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	 		
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00052	 		
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00025	 	<u></u>	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0477	 		
beryllium, dissolved	7440-41-7	E421	0.020	μg/L	<0.020	 	<u></u>	
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	 	<u></u>	
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.011	 		
cadmium, dissolved	7440-43-9	E421	0.0050	μg/L	0.0109	 		
calcium, dissolved	7440-70-2	E421	0.050	mg/L	178	 	<u></u>	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	 	<u></u>	
cobalt, dissolved	7440-48-4	E421	0.10	μg/L	<0.10	 		
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00038	 		
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	 		
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	 		
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0194	 		
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	181	 		
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00106	 		
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	 		
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00162	 		

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Water (Matrix: Water)			CI	ient sample ID	RG_GHP_WS_L AEMP_GC_202 2-09 N	 	
			Client samp	ling date / time	19-Sep-2022 09:15	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213024-001	 	
					Result	 	
Dissolved Metals							
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00977	 	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.70	 	
selenium, dissolved	7782-49-2	E421	0.050	μg/L	215 DTSE	 	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.41	 	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	 	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.72	 	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.197	 	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	257	 	
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000010	 	
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	 	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	 	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00840	 	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	 	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	 	
dissolved mercury filtration location		EP509	-	-	Field	 	
dissolved metals filtration location		EP423	-	-	Field	 	
dissolved metals filtration location		EP421	-	-	Field	 	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2213024** Page : 1 of 13

Amendment : 2

Client : Teck Coal Limited Laboratory : Calgary - Environmental Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets

Address : 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

Telephone : ---- Telephone : +1 403 407 1800

Project : REGIONAL EFFECTS PROGRAM Date Samples Received : 22-Sep-2022 08:58

PO : VPO00816101 | Issue Date : 12-Oct-2022 16:00

C-O-C number : GHO_RAEMP_2022-09_ALS

Sampler : Jennifer Ings

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 1
No. of samples analysed : 1

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

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

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

No Quality Control Sample Frequency Outliers occur.		

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analysis Holding Time Compliance

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

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

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

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

Matrix: Water					E	/aluation: 🗴 =	Holding time exce	edance ; 🛚	= Within	Holding Tim
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_GHP_WS_LAEMP_GC_2022-09_N	E298	19-Sep-2022	23-Sep-2022				23-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.Br-L	19-Sep-2022	22-Sep-2022				22-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.CI-L	19-Sep-2022	22-Sep-2022				22-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Le	vel 0.001									
HDPE RG GHP WS LAEMP GC 2022-09 N	E378-U	19-Sep-2022	23-Sep-2022				23-Sep-2022	3 days	4 days	<u>*</u>
NG_GHF_W3_LAEMF_GG_2022-09_N	L370-0	19-3ep-2022	23-3ep-2022				23-3ep-2022	3 days	4 uays	EHTL
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.F	19-Sep-2022	22-Sep-2022				22-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.NO3-L	19-Sep-2022	22-Sep-2022	3 days	4 days	# EHTL	22-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.NO2-L	19-Sep-2022	22-Sep-2022				22-Sep-2022	3 days	4 days	# EHTL

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Client : Teck Coal Limited

: REGIONAL EFFECTS PROGRAM Project



Matrix: Water					Ev	valuation: ≭ =	Holding time exce	edance ; ·	✓ = Within	Holding T
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E235.SO4	19-Sep-2022	22-Sep-2022				22-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low L	.evel)									
Amber glass total (sulfuric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E318	19-Sep-2022	23-Sep-2022				24-Sep-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E372-U	19-Sep-2022	23-Sep-2022				24-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low	Level)									
HDPE dissolved (nitric acid)	E404 O- I	40 0 2000	04.0 0000				04.0 0000		<i>-</i>	√
RG_GHP_WS_LAEMP_GC_2022-09_N	E421.Cr-L	19-Sep-2022	24-Sep-2022				24-Sep-2022	180 days	5 days	•
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E509	19-Sep-2022	24-Sep-2022				24-Sep-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG GHP WS LAEMP GC 2022-09 N	E421	19-Sep-2022	24-Sep-2022				24-Sep-2022	180	5 days	✓
		·	·				'	days	,	
Metals : Digested Dissolved Selenium in Water by CRC ICPMS										
Amber glass vial dissolved (nitric acid)	E40040	40.0 0000	40.0.4.0000				40.0.4.000		00.1	,
RG_GHP_WS_LAEMP_GC_2022-09_N	E423ASe	19-Sep-2022	12-Oct-2022				12-Oct-2022	180 days	23 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion	n (Low Level)							, ,		
Amber glass dissolved (sulfuric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E358-L	19-Sep-2022	22-Sep-2022				23-Sep-2022	28 days	4 days	✓
	Combustion (I									
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Amber glass total (sulfuric acid)	Compustion (Low Level)									
RG_GHP_WS_LAEMP_GC_2022-09_N	E355-L	19-Sep-2022	22-Sep-2022				23-Sep-2022	28 days	4 days	✓
_										

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



Matrix: Water					Εν	⁄aluation: ≭ =	Holding time excee	edance ; •	✓ = Within	Holding Tin
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holding	ng Times Eval		Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Acidity by Titration									ı	
HDPE RG_GHP_WS_LAEMP_GC_2022-09_N	E283	19-Sep-2022	23-Sep-2022				23-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration							<u> </u>			
HDPE RG GHP WS LAEMP GC 2022-09 N	E290	19-Sep-2022	23-Sep-2022				23-Sep-2022	14 days	4 days	√
		·	. ,				. , .		,	
Physical Tests : Conductivity in Water								I	I	I
HDPE RG_GHP_WS_LAEMP_GC_2022-09_N	E100	19-Sep-2022	23-Sep-2022				23-Sep-2022	28 days	4 days	✓
Physical Tests : ORP by Electrode HDPE										
RG_GHP_WS_LAEMP_GC_2022-09_N	E125	19-Sep-2022					24-Sep-2022	0.25 hrs	121 hrs	# EHTR-FN
Physical Tests : pH by Meter										
HDPE RG GHP WS LAEMP GC 2022-09 N	E108	19-Sep-2022	23-Sep-2022				23-Sep-2022	0.25	0.26	æ
								hrs	hrs	EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG GHP_WS_LAEMP_GC_2022-09_N	E162	19-Sep-2022					24-Sep-2022	7 days	5 days	✓
							·			
Physical Tests : TSS by Gravimetry (Low Level)									ı	
HDPE [TSS-WB] RG_GHP_WS_LAEMP_GC_2022-09_N	E160-L	19-Sep-2022					24-Sep-2022	7 days	5 days	1
							·		-	
Physical Tests : Turbidity by Nephelometry										
HDPE RG_GHP_WS_LAEMP_GC_2022-09_N	E121	19-Sep-2022					22-Sep-2022	3 days	4 days	*
00_2022 00		.0 55p 2022						3 22,0	, 22,0	EHTL
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_GHP_WS_LAEMP_GC_2022-09_N	E420.Cr-L	19-Sep-2022	24-Sep-2022				24-Sep-2022	180	5 days	✓
1.0_0111 _1.0_E11E1111 _00_2022-00_11	2 120.01-2	.0 COP 2022	21 00p 2022					days	Jaayo	

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix: Water Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Analyte Group	Method	Sampling Date	e Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation	Holding	Holding Times Eval		Analysis Date	Holding Times		Eval
			Date	Rec	Actual			Rec	Actual	
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E508	19-Sep-2022	24-Sep-2022				24-Sep-2022	28 days	5 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_GHP_WS_LAEMP_GC_2022-09_N	E420	19-Sep-2022	24-Sep-2022				24-Sep-2022	180	5 days	✓
								days		

Legend & Qualifier Definitions

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

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

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

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			C	ount		Frequency (%)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)					<u>'</u>		
Acidity by Titration	E283	662100	1	20	5.0	5.0	1
Alkalinity Species by Titration	E290	662108	1	20	5.0	5.0	1
Ammonia by Fluorescence	E298	662439	1	19	5.2	5.0	√
Bromide in Water by IC (Low Level)	E235.Br-L	661254	1	15	6.6	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	661255	1	15	6.6	5.0	1
Conductivity in Water	E100	662106	1	20	5.0	5.0	1
Digested Dissolved Selenium in Water by CRC ICPMS	E423ASe	691197	1	1	100.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	661916	1	9	11.1	5.0	1
Dissolved Mercury in Water by CVAAS	E509	662251	1	20	5.0	5.0	1
Dissolved Metals in Water by CRC ICPMS	E421	661917	1	9	11.1	5.0	1
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	661300	1	8	12.5	5.0	1
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	662043	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	661253	1	15	6.6	5.0	1
Nitrate in Water by IC (Low Level)	E235.NO3-L	661252	1	20	5.0	5.0	1
Nitrite in Water by IC (Low Level)	E235.NO2-L	661251	1	19	5.2	5.0	✓
ORP by Electrode	E125	662920	1	14	7.1	5.0	1
pH by Meter	E108	662107	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	661256	1	15	6.6	5.0	✓
TDS by Gravimetry	E162	664427	1	13	7.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	662944	1	15	6.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	662438	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	662245	1	14	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	662945	1	15	6.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	661301	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661974	1	14	7.1	5.0	✓
Turbidity by Nephelometry	E121	661264	1	4	25.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	662100	1	20	5.0	5.0	1
Alkalinity Species by Titration	E290	662108	1	20	5.0	5.0	1
Ammonia by Fluorescence	E298	662439	1	19	5.2	5.0	√
Bromide in Water by IC (Low Level)	E235.Br-L	661254	1	15	6.6	5.0	<u>√</u>
Chloride in Water by IC (Low Level)	E235.CI-L	661255	1	15	6.6	5.0	<u>√</u>
Conductivity in Water	E100	662106	1	20	5.0	5.0	✓
Digested Dissolved Selenium in Water by CRC ICPMS	E423ASe	691197	1	1	100.0	5.0	<u>√</u>
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	661916	1	9	11.1	5.0	√
Dissolved Mercury in Water by CVAAS	E509	662251	1	20	5.0	5.0	<u>√</u>
Dissolved Metals in Water by CRC ICPMS	E421	661917	1	9	11.1	5.0	✓

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

: REGIONAL EFFECTS PROGRAM Project



Matrix: Water		Evaluat	ion: × = QC frequ		з ынсаноп; ∨ = 0		
Quality Control Sample Type	Method	QC Lot #	QC	ount Regular	Actual	Frequency (%) Evaluation
Analytical Methods	Metriod	QC L0t #	- QC	Regulai	Actual	Expected	Evaluation
Laboratory Control Samples (LCS) - Continued					10.5		
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	661300	1	8	12.5	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	662043	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	661253	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	661252	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	661251	1	19	5.2	5.0	✓
ORP by Electrode	E125	662920	1	14	7.1	5.0	✓
pH by Meter	E108	662107	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	661256	1	15	6.6	5.0	✓
TDS by Gravimetry	E162	664427	1	13	7.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	662944	1	15	6.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	662438	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	662245	1	14	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	662945	1	15	6.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	661301	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661974	1	14	7.1	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	664426	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	661264	1	4	25.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	662100	1	20	5.0	5.0	1
Alkalinity Species by Titration	E290	662108	1	20	5.0	5.0	<u> </u>
Ammonia by Fluorescence	E298	662439	1	19	5.2	5.0	1
Bromide in Water by IC (Low Level)	E235.Br-L	661254	1	15	6.6	5.0	1
Chloride in Water by IC (Low Level)	E235.CI-L	661255	1	15	6.6	5.0	√
Conductivity in Water	E100	662106	1	20	5.0	5.0	√
Digested Dissolved Selenium in Water by CRC ICPMS	E423ASe	691197	1	1	100.0	5.0	<u> </u>
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	661916	1	9	11.1	5.0	√
Dissolved Mercury in Water by CVAAS	E509	662251	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	661917	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	661300	1	8	12.5	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	662043	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	661253	1	15	6.6	5.0	√
Nitrate in Water by IC (Low Level)	E235.NO3-L	661252	1	20	5.0	5.0	√
Nitrite in Water by IC (Low Level)		661251	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.NO2-L	661256	1	15	6.6	5.0	
•	E235.SO4	664427	1	13	7.6	5.0	✓
TDS by Gravimetry Total Chromium in Water by CRC ICPMS (Level evel)	E162		1	15	-		✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	662944			6.6	5.0	√
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	662438	1	19	5.2	5.0	√
Total Mercury in Water by CVAAS	E508	662245	1	14	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	662945	1	15	6.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	661301	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661974	1	14	7.1	5.0	✓

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Matrix: Water Evaluation: × = QC frequency outside specification, ✓ = QC frequency within specification.

Quality Control Sample Type			Co	ount			
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Method Blanks (MB) - Continued							
TSS by Gravimetry (Low Level)	E160-L	664426	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	661264	1	4	25.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	662439	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	661254	1	15	6.6	5.0	✓
Chloride in Water by IC (Low Level)	E235.CI-L	661255	1	15	6.6	5.0	√
Digested Dissolved Selenium in Water by CRC ICPMS	E423ASe	691197	1	1	100.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	661916	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	662251	1	20	5.0	5.0	√
Dissolved Metals in Water by CRC ICPMS	E421	661917	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	661300	1	8	12.5	5.0	√
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	662043	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	661253	1	15	6.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	661252	1	20	5.0	5.0	√
Nitrite in Water by IC (Low Level)	E235.NO2-L	661251	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	661256	1	15	6.6	5.0	√
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	662944	1	15	6.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	662438	1	19	5.2	5.0	√
Total Mercury in Water by CVAAS	E508	662245	1	14	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	662945	1	15	6.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	661301	1	9	11.1	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661974	1	14	7.1	5.0	√

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water
	Calgary - Environmental			sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results,
	Calgary - Environmental			pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ODD L. El . L	Calgary - Environmental	147.4	AOTH D (400 ())	
ORP by Electrode	E125	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test
T201- 0	Calgary - Environmental	147 - 1	ADUA 0540 D (*****)	results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV
250	Calgary - Environmental			detection.
Chloride in Water by IC (Low Level)	E235.CI-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrata in Matan buile (Lauri auri)	Calgary - Environmental	10/-4	EDA 200 4 (
Nitrate in Water by IC (Low Level)	E235.NO3-L	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Culfata in Water by IC	Calgary - Environmental	\A/-+	EDA 200 4 (
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	0 7	Water	APHA 2310 B (mod)	Acidity is determined by potentiametric titration to pH andpoint of 8.3
Acions by Intrancin	E283	vvalei	AFIIA 2310 B (IIIOd)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
	Calgary - Environmental			

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total metals in Water by CRC ICPMS	E420 Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Calgary - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Calgary - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Digested Dissolved Selenium in Water by CRC ICPMS	E423ASe Calgary - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45um), digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Total Mercury in Water by CVAAS	E508 Calgary - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Calgary - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Calgary - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	АРНА 3030В	Water samples are filtered (0.45 um), and preserved with HNO3.

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Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Metals Water Digestion and	EP423	Water	APHA 3030B	Water samples are filtered (0.45 um) and digested with nitric and hydrochloric acids.
Filtration				
	Calgary - Environmental			
Dissolved Mercury Water Filtration	EP509	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
	Calgary - Environmental			



QUALITY CONTROL REPORT

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Amendment

Client : Teck Coal Limited Laboratory : Calgary - Environmental Contact : Giovanna Diaz **Account Manager** : Lyudmyla Shvets Address :421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Telephone

Date Samples Received Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number :GHO RAEMP 2022-09 ALS

Sampler : Jennifer Ings

Site

: Teck Coal Master Quote Quote number

No. of samples received : 1 No. of samples analysed : 1

Calgary, Alberta Canada T1Y 7B5 Telephone :+1 403 407 1800 :22-Sep-2022 08:58

: 22-Sep-2022 Issue Date : 12-Oct-2022 16:00

Date Analysis Commenced

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

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Calgary Metals, Calgary, Alberta
Kevin Baxter		Calgary Metals, Calgary, Alberta
Mackenzie Lamoureux	Laboratory Analyst	Calgary Metals, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Calgary Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Calgary Inorganics, Calgary, Alberta
Sara Niroomand		Calgary Inorganics, Calgary, Alberta
Sara Niroomand		Calgary Metals, Calgary, Alberta
Sheida Aria	Lab Assistant	Calgary Metals, Calgary, Alberta
Shirley Li		Calgary Metals, Calgary, Alberta
Vladka Stamenova	Analyst	Calgary Inorganics, Calgary, Alberta

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General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

ub-Matrix: Water						Laboratory Duplicate (DUP) Report							
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie		
Physical Tests (QC	Lot: 661264)												
CG2213024-001	RG_GHP_WS_LAEMP_G C_2022-09_N	turbidity		E121	0.10	NTU	1.22	1.31	0.08	Diff <2x LOR			
Physical Tests (QC	Lot: 662100)												
G2212785-004	Anonymous	acidity (as CaCO3)		E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR			
hysical Tests (QC	Lot: 662106)												
G2212785-004	Anonymous	conductivity		E100	2.0	μS/cm	<2.0	<2.0	0	Diff <2x LOR			
hysical Tests (QC	Lot: 662107)												
G2212785-004	Anonymous	pH		E108	0.10	pH units	5.15	5.11	0.780%	4%			
Physical Tests (QC	Lot: 662108)												
G2212785-004	Anonymous	alkalinity, bicarbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR			
		alkalinity, carbonate (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR			
		alkalinity, hydroxide (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR			
		alkalinity, total (as CaCO3)		E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR			
Physical Tests (QC	Lot: 662920)												
CG2212931-001	Anonymous	oxidation-reduction potential [ORP]		E125	0.10	mV	336	337	0.297%	15%			
hysical Tests (QC	Lot: 664427)												
CG2213024-001	RG_GHP_WS_LAEMP_G C 2022-09 N	solids, total dissolved [TDS]		E162	20	mg/L	1320	1320	0.416%	20%			
Anions and Nutrien	ts (QC Lot: 661251)												
CG2213023-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.0082	0.0081	0.0001	Diff <2x LOR			
nions and Nutrien	ts (QC Lot: 661252)												
G2213023-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	46.9	47.4	0.920%	20%			
nions and Nutrien	ts (QC Lot: 661253)												
CG2213023-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.139	0.143	0.004	Diff <2x LOR			
nions and Nutrien	ts (QC Lot: 661254)												
CG2213023-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR			
nions and Nutrien	ts (QC Lot: 661255)												
G2213023-001	Anonymous	chloride	16887-00-6	E235.CI-L	0.50	mg/L	13.5	13.0	3.42%	20%			
nions and Nu <u>trien</u>	ts (QC Lot: 661256)												
G2213023-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1860	1880	0.911%	20%			
nions and Nu <u>trien</u>	ts (QC Lot: 661974)												
CG2212931-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0051	0.0047	0.0004	Diff <2x LOR			

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Client : Teck Coal Limited



Sub-Matrix: Water			Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Anions and Nutrien	ts (QC Lot: 662043)										
CG2213003-025	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 662438)										
CG2213021-001	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.500	mg/L	3.54	3.58	0.039	Diff <2x LOR	
Anions and Nutrien	ts (QC Lot: 662439)										
CG2213021-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.456	0.435	4.67%	20%	
Organic / Inorganic	Carbon (QC Lot: 66130	0)									
CG2213024-001	RG_GHP_WS_LAEMP_G C_2022-09_N	carbon, dissolved organic [DOC]		E358-L	0.50	mg/L	1.44	1.54	0.09	Diff <2x LOR	
Organic / Inorganic	Carbon (QC Lot: 66130	1)									
CG2213024-001	RG_GHP_WS_LAEMP_G C_2022-09_N	carbon, total organic [TOC]		E355-L	0.50	mg/L	1.47	1.49	0.02	Diff <2x LOR	
Metals (QC Lot: 691	1197)										
CG2213024-001	RG_GHP_WS_LAEMP_G C_2022-09_N	selenium, dissolved	7782-49-2	E423ASe	0.000050	mg/L	159 µg/L	0.161	1.25%	20%	
Total Metals (QC Lo	ot: 662245)										
CG2212931-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Total Metals (QC Lo	ot: 662944)										
CG2212812-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00025	0.00023	0.00002	Diff <2x LOR	
Total Metals (QC Lo	ot: 662945)										
CG2212812-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0182	0.0179	0.0002	Diff <2x LOR	
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00015	0.00016	0.00002	Diff <2x LOR	
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0476	0.0477	0.283%	20%	
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0121 µg/L	0.0000122	0.00000007	Diff <2x LOR	
		calcium, total	7440-70-2	E420	0.050	mg/L	43.1	43.1	0.131%	20%	
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	
		iron, total	7439-89-6	E420	0.010	mg/L	0.016	0.017	0.00008	Diff <2x LOR	
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0020	0.0021	0.00010	Diff <2x LOR	
		magnesium, total	7439-95-4	E420	0.0050	mg/L	11.2	11.0	1.08%	20%	
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00340	0.00344	1.23%	20%	
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00106	0.00108	1.31%	20%	
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Client : Teck Coal Limited



Sub-Matrix: Water	b-Matrix: Water						Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie		
Total Metals (QC Lo	ot: 662945) - continued												
CG2212812-001	Anonymous	potassium, total	7440-09-7	E420	0.050	mg/L	0.384	0.386	0.002	Diff <2x LOR			
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.730 μg/L	0.000737	0.973%	20%			
		silicon, total	7440-21-3	E420	0.10	mg/L	1.77	1.77	0.161%	20%			
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR			
		sodium, total	7440-23-5	E420	0.050	mg/L	0.668	0.672	0.627%	20%			
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.209	0.214	2.15%	20%			
		sulfur, total	7704-34-9	E420	0.50	mg/L	6.52	6.41	1.77%	20%			
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR			
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR			
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR			
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000685	0.000700	2.11%	20%			
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR			
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR			
issolved Metals (C L ot: 661916)												
G2213024-001	RG_GHP_WS_LAEMP_G C 2022-09 N	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR			
issolved Metals (I	I					
G2213024-001	RG_GHP_WS_LAEMP_G C 2022-09 N	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR			
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00052	0.00050	0.00002	Diff <2x LOR			
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00025	0.00024	0.00001	Diff <2x LOR			
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0477	0.0454	4.94%	20%			
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR			
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR			
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.011	0.011	0.00006	Diff <2x LOR			
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0109 µg/L	0.0000089	0.0000020	Diff <2x LOR			
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	178	177	0.566%	20%			
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR			
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00038	0.00034	0.00004	Diff <2x LOR			
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR			
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR			
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0194	0.0189	2.31%	20%			
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	181	173	4.43%	20%			
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00106	0.00104	1.68%	20%			
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00162	0.00160	0.977%	20%			
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00977	0.00931	4.82%	20%			
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Client : Teck Coal Limited



Sub-Matrix: Water	p-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier	
Dissolved Metals (QC Lot: 661917) - contin	nued										
CG2213024-001	RG_GHP_WS_LAEMP_G C 2022-09 N	potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.70	2.63	2.70%	20%		
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	215 μg/L	0.208	3.17%	20%		
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.41	4.19	5.16%	20%		
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR		
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.72	2.61	4.00%	20%		
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.197	0.199	0.834%	20%		
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	257	247	3.91%	20%		
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000010	0.000010	0.00000003	Diff <2x LOR		
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR		
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR		
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00840	0.00842	0.284%	20%		
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR		
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR		
Dissolved Metals (QC Lot: 662251)											
CG2212715-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR		

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Method Blank (MB) Report

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

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 661264)					
turbidity	E121	0.1	NTU	<0.10	
Physical Tests (QCLot: 662100)					
acidity (as CaCO3)	E283	2	mg/L	<2.0	
Physical Tests (QCLot: 662106)					
conductivity	E100	1	μS/cm	<1.0	
Physical Tests (QCLot: 662108)					
alkalinity, bicarbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, carbonate (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, hydroxide (as CaCO3)	E290	1	mg/L	<1.0	
alkalinity, total (as CaCO3)	E290	1	mg/L	<1.0	
Physical Tests (QCLot: 664426)					
solids, total suspended [TSS]	E160-L	1	mg/L	<1.0	
Physical Tests (QCLot: 664427)					
solids, total dissolved [TDS]	E162	10	mg/L	<10	
Anions and Nutrients (QCLot: 661251)					
nitrite (as N)	14797-65-0 E235.NO2-L	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 661252)					
nitrate (as N)	14797-55-8 E235.NO3-L	0.005	mg/L	<0.0050	
Anions and Nutrients (QCLot: 661253)					
luoride	16984-48-8 E235.F	0.02	mg/L	<0.020	
Anions and Nutrients (QCLot: 661254)					
promide	24959-67-9 E235.Br-L	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 661255)					
chloride	16887-00-6 E235.CI-L	0.1	mg/L	<0.10	
Anions and Nutrients (QCLot: 661256)					
sulfate (as SO4)	14808-79-8 E235.SO4	0.3	mg/L	<0.30	
Anions and Nutrients (QCLot: 661974)					
phosphorus, total	7723-14-0 E372-U	0.002	mg/L	<0.0020	
Anions and Nutrients (QCLot: 662043)					
phosphate, ortho-, dissolved (as P)	14265-44-2 E378-U	0.001	mg/L	<0.0010	
Anions and Nutrients (QCLot: 662438)					
(jeldahl nitrogen, total [TKN]	E318	0.05	mg/L	<0.050	

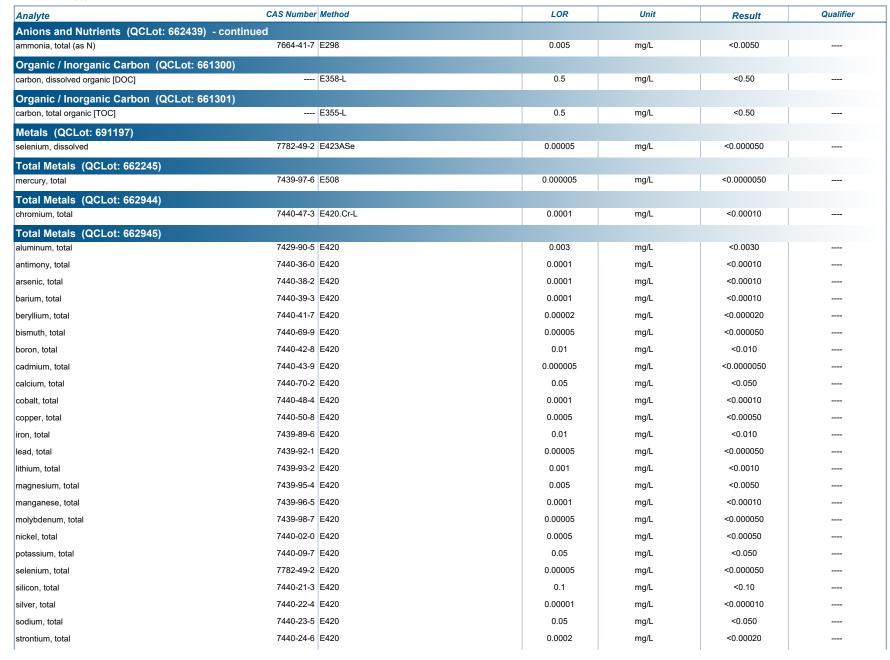
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM

Sub-Matrix: Water





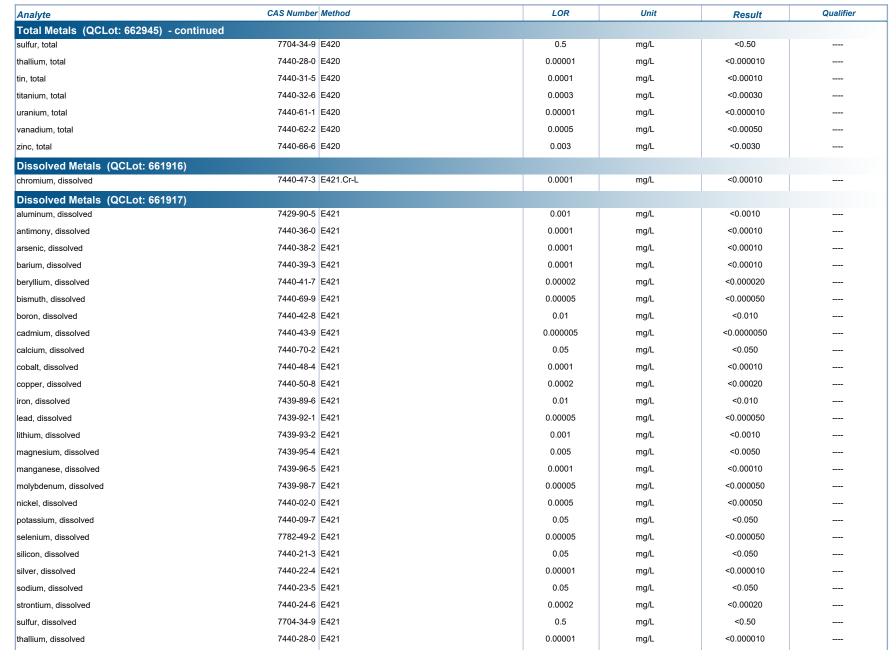
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM

Sub-Matrix: Water





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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM

Sub-Matrix: Water

Analyte	CAS Number I	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 661917) - c	ontinued					
tin, dissolved	7440-31-5 E	E421	0.0001	mg/L	<0.00010	
titanium, dissolved	7440-32-6 I	E421	0.0003	mg/L	<0.00030	
uranium, dissolved	7440-61-1 I	E421	0.00001	mg/L	<0.000010	
vanadium, dissolved	7440-62-2 I	E421	0.0005	mg/L	<0.00050	
zinc, dissolved	7440-66-6 I	E421	0.001	mg/L	<0.0010	
Dissolved Metals (QCLot: 662251)						
mercury, dissolved	7439-97-6 I	E509	0.000005	mg/L	<0.000050	



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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Water						Laboratory Cor	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 661264)									
turbidity		E121	0.1	NTU	200 NTU	106	85.0	115	
Physical Tests (QCLot: 662100)									
acidity (as CaCO3)		E283	2	mg/L	50 mg/L	106	85.0	115	
Physical Tests (QCLot: 662106)									
conductivity		E100	1	μS/cm	146.9 μS/cm	95.9	90.0	110	
Physical Tests (QCLot: 662107)									
рН		E108		pH units	7 pH units	101	98.6	101	
Physical Tests (QCLot: 662108)									
alkalinity, total (as CaCO3)		E290	1	mg/L	500 mg/L	105	85.0	115	
Physical Tests (QCLot: 662920)									
oxidation-reduction potential [ORP]		E125		mV	220 mV	102	95.4	104	
Physical Tests (QCLot: 664426)									
solids, total suspended [TSS]		E160-L	1	mg/L	150 mg/L	102	85.0	115	
Physical Tests (QCLot: 664427)									
solids, total dissolved [TDS]		E162	10	mg/L	1000 mg/L	93.0	85.0	115	
Anions and Nutrients (QCLot: 661251)	44707.05.0	E005 NO0 I	0.004	77 m/l	2.5 "	25.0	00.0	440	ı
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	95.9	90.0	110	
Anions and Nutrients (QCLot: 661252)	14797-55-8	T225 NO2 I	0.005		0.5 "	100	90.0	110	I
nitrate (as N)	14797-55-6	E235.NO3-L	0.005	mg/L	2.5 mg/L	100	90.0	110	
Anions and Nutrients (QCLot: 661253)	16984-48-8	E225 E	0.02	mg/L	4 //	404	90.0	110	l
fluoride	10904-40-0	E233.F	0.02	IIIg/L	1 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 661254)	24959-67-9	E235 Br I	0.05	mg/L	0.5	400	85.0	115	
	24939-01-9	LZ33.BI-L	0.03	IIIg/L	0.5 mg/L	100	65.0	115	
Anions and Nutrients (QCLot: 661255)	16887-00-6	E235 CLI	0.1	mg/L	100 mg/L	99.9	90.0	110	I
	10007-00-0	LZ33.GI-L	0.1	IIIg/L	100 mg/L	99.9	90.0	110	
Anions and Nutrients (QCLot: 661256) sulfate (as SO4)	14808-79-8	F235 SO4	0.3	mg/L	100 mg/L	102	90.0	110	
, ,	14000-19-0		0.0	mg/L	TOU HIG/L	102	30.0	110	
Anions and Nutrients (QCLot: 661974) phosphorus, total	7723-14-0	F372-I I	0.002	mg/L	0.03 mg/L	91.3	80.0	120	
	7725-14-0		0.002	mg/L	0.03 Hg/L	91.3	00.0	120	
Anions and Nutrients (QCLot: 662043) phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	91.9	80.0	120	
	14200 44-2		0.001	9/2	0.00 mg/L	31.3	55.5	120	
Anions and Nutrients (QCLot: 662438)									

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Client : Teck Coal Limited



b-Matrix: Water					Laboratory Control Sample (LCS) Report							
					Spike	Recovery (%)	Recovery	Limits (%)				
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier			
Anions and Nutrients (QCLot: 662438) - continue	d											
Kjeldahl nitrogen, total [TKN]		E318	0.05	mg/L	4 mg/L	104	75.0	125				
Anions and Nutrients (QCLot: 662439)												
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	96.0	85.0	115				
Organic / Inorganic Carbon (QCLot: 661300)												
carbon, dissolved organic [DOC]		E358-L	0.5	mg/L	8.57 mg/L	99.9	80.0	120				
Organic / Inorganic Carbon (QCLot: 661301)												
carbon, total organic [TOC]		E355-L	0.5	mg/L	8.57 mg/L	101	80.0	120				
Metals (QCLot: 691197)												
selenium, dissolved	7782-49-2	E423ASe	0.00005	mg/L	1 mg/L	91.2	80.0	120				
Total Metals (QCLot: 662245)												
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120				
Total Metals (QCLot: 662944)												
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	96.3	80.0	120				
Total Metals (QCLot: 662945)									1			
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	101	80.0	120				
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	101	80.0	120				
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	97.5	80.0	120				
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	98.1	80.0	120				
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120				
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	95.5	80.0	120				
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.9	80.0	120				
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	95.4	80.0	120				
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	95.9	80.0	120				
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.2	80.0	120				
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	94.6	80.0	120				
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	104	80.0	120				
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	94.8	80.0	120				
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	104	80.0	120				
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	97.8	80.0	120				
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.9	80.0	120				
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	98.4	80.0	120				
nickel, total					· ·			I				
	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	95.5	80.0	120				
potassium, total	7440-02-0 7440-09-7		0.0005 0.05	mg/L mg/L	0.5 mg/L 50 mg/L	95.5 100	80.0 80.0	120 120				

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



Sub-Matrix: Water			Laboratory Control Sample (LCS) Report						
				Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Total Metals (QCLot: 662945) - con	tinued								
silicon, total	7440-21-3 E420	0.1	mg/L	10 mg/L	93.0	60.0	140		
silver, total	7440-22-4 E420	0.00001	mg/L	0.1 mg/L	94.5	80.0	120		
sodium, total	7440-23-5 E420	0.05	mg/L	50 mg/L	101	80.0	120		
strontium, total	7440-24-6 E420	0.0002	mg/L	0.25 mg/L	98.6	80.0	120		
sulfur, total	7704-34-9 E420	0.5	mg/L	50 mg/L	104	80.0	120		
thallium, total	7440-28-0 E420	0.00001	mg/L	1 mg/L	93.4	80.0	120		
tin, total	7440-31-5 E420	0.0001	mg/L	0.5 mg/L	95.7	80.0	120		
titanium, total	7440-32-6 E420	0.0003	mg/L	0.25 mg/L	99.2	80.0	120		
uranium, total	7440-61-1 E420	0.00001	mg/L	0.005 mg/L	95.3	80.0	120		
vanadium, total	7440-62-2 E420	0.0005	mg/L	0.5 mg/L	98.0	80.0	120		
zinc, total	7440-66-6 E420	0.003	mg/L	0.5 mg/L	92.4	80.0	120		
Dissolved Metals (QCLot: 661916)									
chromium, dissolved	7440-47-3 E421.Cr-l	L 0.0001	mg/L	0.25 mg/L	99.5	80.0	120		
Dissolved Metals (QCLot: 661917)									
aluminum, dissolved	7429-90-5 E421	0.001	mg/L	2 mg/L	105	80.0	120		
antimony, dissolved	7440-36-0 E421	0.0001	mg/L	1 mg/L	108	80.0	120		
arsenic, dissolved	7440-38-2 E421	0.0001	mg/L	1 mg/L	101	80.0	120		
barium, dissolved	7440-39-3 E421	0.0001	mg/L	0.25 mg/L	104	80.0	120		
beryllium, dissolved	7440-41-7 E421	0.00002	mg/L	0.1 mg/L	102	80.0	120		
bismuth, dissolved	7440-69-9 E421	0.00005	mg/L	1 mg/L	99.1	80.0	120		
boron, dissolved	7440-42-8 E421	0.01	mg/L	1 mg/L	100	80.0	120		
cadmium, dissolved	7440-43-9 E421	0.000005	mg/L	0.1 mg/L	99.6	80.0	120		
calcium, dissolved	7440-70-2 E421	0.05	mg/L	50 mg/L	99.1	80.0	120		
cobalt, dissolved	7440-48-4 E421	0.0001	mg/L	0.25 mg/L	101	80.0	120		
copper, dissolved	7440-50-8 E421	0.0002	mg/L	0.25 mg/L	100	80.0	120		
iron, dissolved	7439-89-6 E421	0.01	mg/L	1 mg/L	112	80.0	120		
lead, dissolved	7439-92-1 E421	0.00005	mg/L	0.5 mg/L	100	80.0	120		
lithium, dissolved	7439-93-2 E421	0.001	mg/L	0.25 mg/L	94.5	80.0	120		
magnesium, dissolved	7439-95-4 E421	0.005	mg/L	50 mg/L	105	80.0	120		
manganese, dissolved	7439-96-5 E421	0.0001	mg/L	0.25 mg/L	103	80.0	120		
molybdenum, dissolved	7439-98-7 E421	0.00005	mg/L	0.25 mg/L	103	80.0	120		
nickel, dissolved	7440-02-0 E421	0.0005	mg/L	0.5 mg/L	101	80.0	120		
potassium, dissolved	7440-09-7 E421	0.05	mg/L	50 mg/L	104	80.0	120		
selenium, dissolved	7782-49-2 E421	0.00005	mg/L	1 mg/L	95.7	80.0	120		
silicon, dissolved	7440-21-3 E421	0.05	mg/L	10 mg/L	106	60.0	140		
silver, dissolved	7440-22-4 E421	0.00001	mg/L	0.1 mg/L	90.1	80.0	120		
		0.0001	9/ =	U. i ilig/L	30.1				

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



Sub-Matrix: Water	Laboratory Control Sample (LCS) Report								
					Spike Recovery (%)		Recovery		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 661917) - contin	nued								
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	107	80.0	120	
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.5	80.0	120	
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	103	80.0	120	
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	95.0	80.0	120	
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.8	80.0	120	
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	91.5	80.0	120	

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

	Matrix Spike (MS) Report								
Recover	ry Limits (%)								
Low	High	Qualifier							
75.0	125								
	'								
75.0	125								
75.0	125								
75.0	125								
75.0	125								
75.0	125								
70.0	130								
70.0	130								
70.0	130								
75.0	125								
70.0	130								
70.0	130								
70.0	130								
70.0	130								
	70.0 75.0 70.0 70.0	70.0 130 75.0 125 70.0 130 70.0 130							

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



b-Matrix: Water				Matrix Spike (MS) Report								
					Spil		Recovery (%)		Limits (%)			
oratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifie		
al Metals (QC	CLot: 662944)											
2212931-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.409 mg/L	0.4 mg/L	102	70.0	130			
tal Metals (QC	CLot: 662945)											
G2212931-001	Anonymous	aluminum, total	7429-90-5	E420	2.05 mg/L	2 mg/L	102	70.0	130			
		antimony, total	7440-36-0	E420	0.209 mg/L	0.2 mg/L	104	70.0	130			
		arsenic, total	7440-38-2	E420	0.205 mg/L	0.2 mg/L	102	70.0	130			
		barium, total	7440-39-3	E420	0.208 mg/L	0.2 mg/L	104	70.0	130			
		beryllium, total	7440-41-7	E420	0.412 mg/L	0.4 mg/L	103	70.0	130			
		bismuth, total	7440-69-9	E420	0.103 mg/L	0.1 mg/L	103	70.0	130			
		boron, total	7440-42-8	E420	1.05 mg/L	1 mg/L	105	70.0	130			
		cadmium, total	7440-43-9	E420	0.0424 mg/L	0.04 mg/L	106	70.0	130			
		calcium, total	7440-70-2	E420	ND mg/L	40 mg/L	ND	70.0	130			
		cobalt, total	7440-48-4	E420	0.207 mg/L	0.2 mg/L	103	70.0	130			
		copper, total	7440-50-8	E420	0.205 mg/L	0.2 mg/L	102	70.0	130			
		iron, total	7439-89-6	E420	20.5 mg/L	20 mg/L	103	70.0	130			
		lead, total	7439-92-1	E420	0.204 mg/L	0.2 mg/L	102	70.0	130			
		lithium, total	7439-93-2	E420	1.02 mg/L	1 mg/L	102	70.0	130			
		magnesium, total	7439-95-4	E420	ND mg/L	10 mg/L	ND	70.0	130			
		manganese, total	7439-96-5	E420	0.209 mg/L	0.2 mg/L	104	70.0	130			
		molybdenum, total	7439-98-7	E420	0.208 mg/L	0.2 mg/L	104	70.0	130			
		nickel, total	7440-02-0	E420	0.409 mg/L	0.4 mg/L	102	70.0	130			
		potassium, total	7440-09-7	E420	40.9 mg/L	40 mg/L	102	70.0	130			
		selenium, total	7782-49-2	E420	0.392 mg/L	0.4 mg/L	98.0	70.0	130			
		silicon, total	7440-21-3	E420	86.9 mg/L	100 mg/L	86.9	70.0	130			
		silver, total	7440-22-4	E420	0.0456 mg/L	0.04 mg/L	114	70.0	130			
		sodium, total	7440-23-5	E420	21.3 mg/L	20 mg/L	107	70.0	130			
		strontium, total	7440-24-6	E420	0.216 mg/L	0.2 mg/L	108	70.0	130			
		sulfur, total	7704-34-9	E420	173 mg/L	200 mg/L	86.7	70.0	130			
		thallium, total	7440-28-0	E420	0.0389 mg/L	0.04 mg/L	97.3	70.0	130			
		tin, total	7440-31-5	E420	0.206 mg/L	0.2 mg/L	103	70.0	130			
		titanium, total	7440-32-6	E420	0.416 mg/L	0.4 mg/L	104	70.0	130			
		uranium, total	7440-61-1	E420	0.0400 mg/L	0.04 mg/L	100	70.0	130			
		vanadium, total	7440-62-2	E420	1.02 mg/L	1 mg/L	102	70.0	130			
		zinc, total	7440-66-6	E420	4.02 mg/L	4 mg/L	100	70.0	130			
solved Metals	(QCLot: 661916)											
2213025-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.382 mg/L	0.4 mg/L	95.4	70.0	130			

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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



Sub-Matrix: Water			Matrix Spike (MS) Report								
					Spi	ke	Recovery (%)	Recovery			
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier	
	(QCLot: 661917) -	continued									
CG2213025-001	Anonymous	aluminum, dissolved	7429-90-5	E421	1.99 mg/L	2 mg/L	99.3	70.0	130		
		antimony, dissolved	7440-36-0	E421	0.199 mg/L	0.2 mg/L	99.6	70.0	130		
		arsenic, dissolved	7440-38-2	E421	0.190 mg/L	0.2 mg/L	95.3	70.0	130		
		barium, dissolved	7440-39-3	E421	0.187 mg/L	0.2 mg/L	93.6	70.0	130		
		beryllium, dissolved	7440-41-7	E421	0.385 mg/L	0.4 mg/L	96.4	70.0	130		
		bismuth, dissolved	7440-69-9	E421	0.0905 mg/L	0.1 mg/L	90.5	70.0	130		
		boron, dissolved	7440-42-8	E421	0.979 mg/L	1 mg/L	97.9	70.0	130		
		cadmium, dissolved	7440-43-9	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130		
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130		
		cobalt, dissolved	7440-48-4	E421	0.192 mg/L	0.2 mg/L	96.1	70.0	130		
		copper, dissolved	7440-50-8	E421	0.193 mg/L	0.2 mg/L	96.7	70.0	130		
		iron, dissolved	7439-89-6	E421	19.4 mg/L	20 mg/L	96.9	70.0	130		
		lead, dissolved	7439-92-1	E421	0.188 mg/L	0.2 mg/L	93.9	70.0	130		
		lithium, dissolved	7439-93-2	E421	0.860 mg/L	1 mg/L	86.0	70.0	130		
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130		
		manganese, dissolved	7439-96-5	E421	0.195 mg/L	0.2 mg/L	97.6	70.0	130		
		molybdenum, dissolved	7439-98-7	E421	0.195 mg/L	0.2 mg/L	97.5	70.0	130		
		nickel, dissolved	7440-02-0	E421	0.384 mg/L	0.4 mg/L	96.0	70.0	130		
		potassium, dissolved	7440-09-7	E421	37.7 mg/L	40 mg/L	94.2	70.0	130		
		selenium, dissolved	7782-49-2	E421	0.322 mg/L	0.4 mg/L	80.6	70.0	130		
		silicon, dissolved	7440-21-3	E421	75.8 mg/L	100 mg/L	75.8	70.0	130		
		silver, dissolved	7440-22-4	E421	0.0389 mg/L	0.04 mg/L	97.3	70.0	130		
		sodium, dissolved	7440-23-5	E421	18.7 mg/L	20 mg/L	93.4	70.0	130		
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 mg/L	ND	70.0	130		
		sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130		
		thallium, dissolved	7440-28-0	E421	0.0362 mg/L	0.04 mg/L	90.4	70.0	130		
		tin, dissolved	7440-31-5	E421	0.192 mg/L	0.2 mg/L	96.2	70.0	130		
		titanium, dissolved	7440-32-6	E421	0.392 mg/L	0.4 mg/L	98.1	70.0	130		
		uranium, dissolved	7440-61-1	E421	0.0369 mg/L	0.04 mg/L	92.2	70.0	130		
		vanadium, dissolved	7440-62-2	E421	0.958 mg/L	1 mg/L	95.8	70.0	130		
		zinc, dissolved	7440-66-6	E421	3.75 mg/L	4 mg/L	93.7	70.0	130		
issolved Metals	(QCLot: 662251)										
CG2212715-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000104 mg/L	0.0001 mg/L	104	70.0	130		

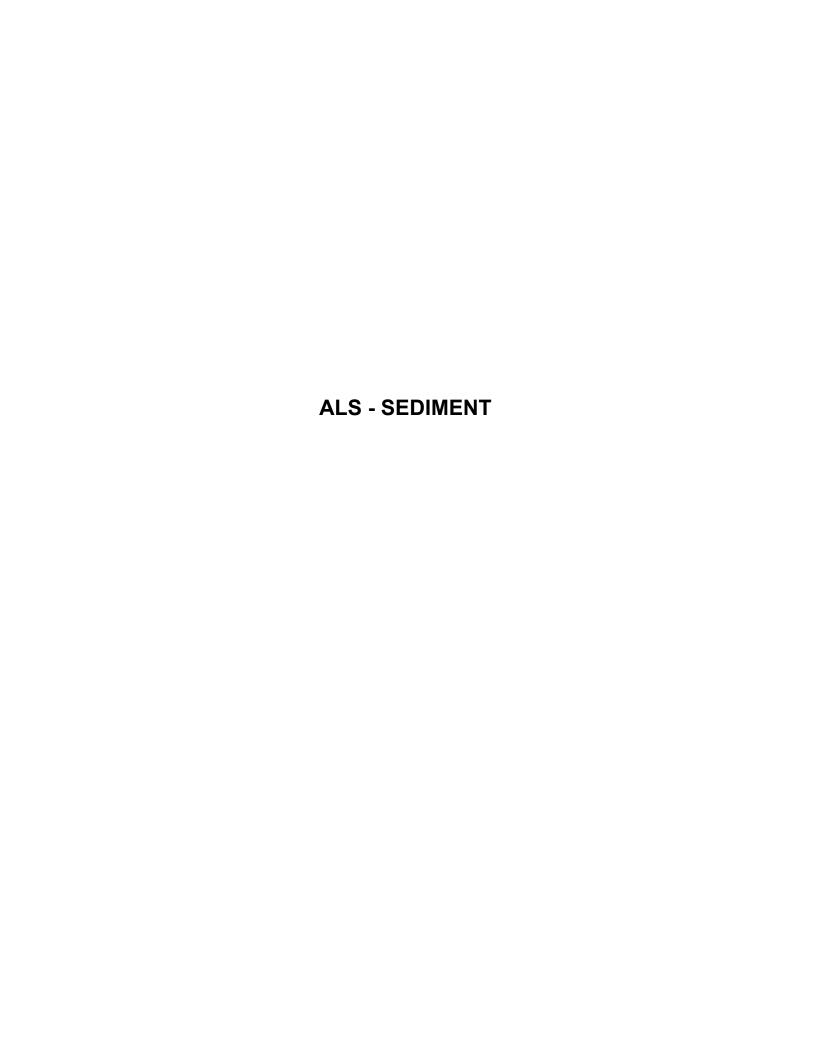
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Work Order : CG2213024 Amendment 2

Client : Teck Coal Limited



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Priority (2-:	3 business days) - 50%	surcharge X	<u> </u>	Quarhier's Mar	ne	<u> </u>		A Di			IVIOD	bile# 5195003444							
Emarganou (1	Business Day) - 100%	031#0hous-						4			,	e/Time September 16, 2022							
For Emergency <1 Day, A	Business Day) - 1007	Surcharge	4	Sampler's Signa	ture		Low	A 1847 5)		Date/	Time	l		Santar	her 16	2022		I





CERTIFICATE OF ANALYSIS

Work Order : CG2212702

Client : Teck Coal Limited

Giovanna Diaz Contact

Address : 421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone

Project : REGIONAL EFFECTS PROGRAM

: VPO00816101

: REP_LAEMP_GC_2022-09_ALS C-O-C number

Sampler : JI Site

Quote number : Teck Coal Master Quote

No. of samples received : 10 : 10 No. of samples analysed

Page : 1 of 19

> Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets Address

: 2559 29th Street NE

Calgary AB Canada T1Y 7B5

Telephone : +1 403 407 1800 **Date Samples Received** : 15-Sep-2022 08:50

Date Analysis Commenced : 19-Sep-2022

Issue Date : 17-Oct-2022 14:39

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

This Certificate of Analysis contains the following information:

- General Comments
- **Analytical Results**
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Laboratory Department	
Amber Sheikh	Laboratory Assistant	Organics, Calgary, Alberta	
Dwayne Bennett	Technical Specialist	Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Sask Soils, Saskatoon, Saskatchewan	
Kuljeet Chawla		Inorganics, Calgary, Alberta	
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia	
Sorina Motea	Laboratory Analyst	Organics, Calgary, Alberta	

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: Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

LOR: Limit of Reporting (detection limit).

Unit	Description			
-	No Unit			
%	percent			
mg/kg	milligrams per kilogram			
pH units	pH units			

<: less than.

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

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

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

Sample Comments

Sample	Client Id	Comment
CG2212702-001	RG_GHBP_SE-1_2022-09-12 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-002	RG_GHBP_SE-2_2022-09-12 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-003	RG_GHBP_SE-3_2022-09-12 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-004	RG_GHBP_SE-4_2022-09-12 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-005	RG_GHBP_SE-5_2022-09-12 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-006	RG_GANF_SE-1_2022-09-13 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-007	RG_GANF_SE-2_2022-09-13 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2212702-008	RG_GANF_SE-3_2022-09-13 _N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

>: greater than.

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: Teck Coal Limited

CG2212702-009	RG_GANF_SE-4_2022-09-13	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be
	_N	higher than usual.
CG2212702-010	RG_GANF_SE-5_2022-09-13	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be
	_N	higher than usual.

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Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil			Ci	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	oling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Physical Tests									
moisture		E144	0.25	%	40.5	57.6	44.1	53.3	60.8
pH (1:2 soil:water)		E108	0.10	pH units	8.40	8.26	8.31	8.21	8.34
Particle Size									
grain size curve		E185A	-	-	See Attached	See Attached	See Attached	See Attached	See Attached
clay (<0.004mm)		EC184A	1.0	%	14.9	24.0	30.5	17.1	15.0
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	10.5	10.6	18.6	14.7	6.8
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	21.4	25.5	37.9	27.1	15.9
sand (0.125mm - 0.063mm)		EC184A	1.0	%	5.3	4.3	5.4	6.3	4.6
sand (0.25mm - 0.125mm)		EC184A	1.0	%	13.4	9.9	5.6	12.3	9.6
sand (0.5mm - 0.25mm)		EC184A	1.0	%	21.3	15.0	1.8	7.4	13.3
sand (1.0mm - 0.50mm)		EC184A	1.0	%	11.2	8.3	<1.0	5.9	17.0
sand (2.0mm - 1.0mm)		EC184A	1.0	%	2.0	2.4	<1.0	7.1	12.8
gravel (>2mm)		EC184A	1.0	%	<1.0	<1.0	<1.0	2.1	5.0
Organic / Inorganic Carbon									
carbon, total [TC]		E351	0.050	%	10.3	14.0	18.6	12.7	13.4
carbon, inorganic [IC]		E354	0.050	%	1.51	1.69	2.22	2.34	4.44
carbon, inorganic [IC], (as CaCO3 equivalent)		E354	0.40	%	12.6	14.1	18.5	19.5	37.0
carbon, total organic [TOC]		EC356	0.050	%	8.79	12.3	16.4	10.4	8.96
Metals									
aluminum	7429-90-5	E440	50	mg/kg	9390	6480	7440	6190	4100
antimony	7440-36-0	E440	0.10	mg/kg	0.83	0.83	0.78	0.62	0.33
arsenic	7440-38-2	E440	0.10	mg/kg	6.95	6.26	7.36	4.45	2.86
barium	7440-39-3	E440	0.50	mg/kg	196	173	223	232	136
beryllium	7440-41-7	E440	0.10	mg/kg	0.79	0.68	0.68	0.58	0.36
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg	10.0	5.8	5.8	6.3	6.2
cadmium	7440-43-9	E440	0.020	mg/kg	1.01	1.20	1.40	1.23	1.10
calcium	7440-70-2	E440	50	mg/kg	41500	50400	62700	71300	107000
chromium	7440-47-3	E440	0.50	mg/kg	14.1	10.8	12.4	9.85	6.25
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Metals 7440- cobalt 7440- iron 7439- lead 7439- lithium 7439- magnesium 7439- marcury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-			Client		_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	2022-09-12 N
Metals cobalt 7440- copper 7440- iron 7439- lead 7439- lithium 7439- mangnesium 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-			Client						
Metals cobalt 7440- copper 7440- iron 7439- lead 7439- lithium 7439- mangnesium 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-			Cilent sampi	ling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
cobalt 7440- copper 7440- iron 7439- lead 7439- magnesium 7439- manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	nber Meth	nod	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
cobalt 7440- copper 7440- iron 7439- lead 7439- magnesium 7439- manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-					Result	Result	Result	Result	Result
copper 7440- iron 7439- lead 7439- lithium 7439- magnesium 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-									
iron 7439- lead 7439- lithium 7439- magnesium 7439- marcury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-			0.10	mg/kg	8.55	7.62	9.61	7.51	5.08
lead 7439- lithium 7439- magnesium 7439- manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	50-8 E44	40	0.50	mg/kg	17.0	16.7	19.0	16.0	10.1
lithium 7439- magnesium 7439- manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	39-6 E44	40	50	mg/kg	20400	17900	21800	12900	9010
magnesium 7439- manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	92-1 E44	40	0.50	mg/kg	13.2	12.6	11.7	10.3	6.32
manganese 7439- mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	93-2 E44	40	2.0	mg/kg	13.9	11.7	12.0	9.2	6.4
mercury 7439- molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	95-4 E44	40	20	mg/kg	6020	5310	6010	5530	5010
molybdenum 7439- nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	96-5 E44	40	1.0	mg/kg	520	433	701	435	281
nickel 7440- phosphorus 7723- potassium 7440- selenium 7782-	97-6 E5 ²	10	0.0050	mg/kg	0.0408	0.0491	0.0422	0.0545	0.0305
phosphorus 7723- potassium 7440- selenium 7782-	98-7 E44	40	0.10	mg/kg	1.66	1.84	1.52	1.22	0.72
potassium 7440- selenium 7782-)2-0 E44	40	0.50	mg/kg	63.5	51.6	68.9	65.3	46.3
selenium 7782-	14-0 E44	40	50	mg/kg	1290	1240	1190	1080	725
)9-7 E44	40	100	mg/kg	2050	1300	1990	1390	1020
l	19-2 E44	40	0.20	mg/kg	6.85	5.54	6.14	8.40	7.66
silver 7440-	22-4 E44	40	0.10	mg/kg	0.20	0.24	0.20	0.24	0.13
sodium 7440-	23-5 E44	40	50	mg/kg	76	59	104	72	69
strontium 7440-	24-6 E44	40	0.50	mg/kg	49.4	50.4	55.6	58.7	60.8
sulfur 7704-	34-9 E44	40	1000	mg/kg	<1000	<1000	<1000	1400	1700
thallium 7440-	28-0 E44	40	0.050	mg/kg	0.237	0.192	0.192	0.180	0.107
tin 7440-	31-5 E44	40	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium 7440-	32-6 E44	40	1.0	mg/kg	15.8	10.3	11.4	9.8	9.1
tungsten 7440-	33-7 E44	40	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
uranium 7440-	61-1 E44	40	0.050	mg/kg	1.04	1.13	1.06	1.36	0.959
vanadium 7440-	62-2 E44	40	0.20	mg/kg	30.4	23.0	26.2	21.8	14.0
zinc 7440-	66-6 E44	10	2.0	mg/kg	132	136	149	124	103
zirconium 7440-	67-7 E44	40	1.0	mg/kg	1.2	1.1	1.0	1.1	<1.0
Polycyclic Aromatic Hydrocarbons									
	32-9 E64	1A	0.050	mg/kg	0.067	0.133	0.178	0.088	0.175
acenaphthylene 208-	96-8 E64	1A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
acridine 260-	94-6 E64	1A	0.050	mg/kg	0.094	0.270	0.356	0.176	0.360
anthracene 120-	12-7 E64	1A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
benz(a)anthracene 56-									e de la companya de la companya de la companya de la companya de la companya de la companya de la companya de

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Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil			CI	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	ling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons benzo(a)pyrene	50-32-8	E641A	0.050	malka	<0.050	<0.050	0.055	<0.050	0.056
` · · · •		E641A	0.050	mg/kg	0.076	0.191	0.033	0.115	0.231
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.076	0.191	0.218	0.115	0.231
benzo(b+j+k)fluoranthene	n/a		0.075	mg/kg		0.191		0.054	0.231
benzo(g,h,i)perylene	191-24-2	E641A		mg/kg	<0.050		0.090		
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
chrysene	218-01-9	E641A	0.050	mg/kg	0.208	0.442	0.530	0.286	0.488
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050
fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	0.081	0.094	0.051	0.103
fluorene	86-73-7	E641A	0.050	mg/kg	0.144	0.319	0.430	0.213	0.438
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	0.847	1.59	2.14	1.09	2.19
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	2.30	4.36	5.94	2.93	6.13
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	1.45	2.77	3.80	1.84	3.94
naphthalene	91-20-3	E641A	0.010	mg/kg	0.426	0.755	1.07	0.509	1.16
phenanthrene	85-01-8	E641A	0.050	mg/kg	0.650	1.73	2.17	1.22	2.03
pyrene	129-00-0	E641A	0.050	mg/kg	0.064	0.134	0.161	0.088	0.159
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	0.067	0.088	0.123	0.076	0.150
IACR (CCME)		E641A	0.60	-	1.00	2.01	2.36	1.37	2.54
IACR AB (coarse)		E641A	0.10	-	<0.10	<0.10	<0.10	<0.10	<0.10
IACR AB (fine)		E641A	0.10	-	<0.10	0.14	0.16	0.10	0.16
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	3.01	6.45	8.59	4.35	8.70
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	1.64	3.95	5.10	2.68	5.09
Polycyclic Aromatic Hydrocarbons Surrogates									
acridine-d9	34749-75-2	E641A	0.1	%	78.9	91.3	84.4	118	94.6
chrysene-d12	1719-03-5	E641A	0.1	%	82.2	80.7	75.5	97.2	82.6
naphthalene-d8	1146-65-2	E641A	0.1	%	83.6	78.0	74.0	94.3	79.6
phenanthrene-d10	1517-22-2	E641A	0.1	%	88.8	99.2	93.0	124	101
Exchangeable & Adsorbed Metals									
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10

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Sub-Matrix: Soil			Cli	ient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	ling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Exchangeable & Adsorbed Metals	7440.00.0	E450	0.050	ma/lea	<0.050	<0.050	<0.050	<0.050	0.060
arsenic, leachable	7440-38-2		0.050	mg/kg	9.20				
barium, leachable	7440-39-3	E450 E450	0.50	mg/kg	9.20 <0.20	12.3	10.9 <0.20	17.6 <0.20	10.8 <0.20
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20 <0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9		0.20	mg/kg			0.185	0.175	<0.050
cadmium, leachable calcium, leachable	7440-43-9	E450 E450	50	mg/kg	0.168 5800	0.250 4290	5030	4320	3270
chromium, leachable	7440-70-2 7440-47-3	E450	0.50	mg/kg mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cobalt, leachable	7440-47-3	E450	0.10	mg/kg	0.14	0.20	0.28	<0.10	0.23
copper, leachable	7440-50-8	E450	0.50	mg/kg	0.92	<0.50	1.23	1.29	1.35
iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-93-0	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450	1.0	mg/kg	20.6	61.8	85.7	10.5	51.3
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450	0.50	mg/kg	2.45	1.96	3.36	1.82	2.76
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	<50	<50	<50
potassium, leachable	7440-09-7	E450	100	mg/kg	140	<100	150	130	160
selenium, leachable	7782-49-2	E450	0.20	mg/kg	0.45	0.27	0.28	<0.20	0.46
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	<100	<100	<100
strontium, leachable	7440-24-6	E450	0.50	mg/kg	7.02	5.07	6.25	5.82	4.60
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450	0.050	mg/kg	0.058	<0.050	0.059	0.050	0.063
vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Carbonate Metals									
aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.053	<0.050	<0.050	<0.050	0.070

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Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil			C	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	oling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Carbonate Metals		E450A	0.0		00.0	00.0	00.5	40.4	04.4
barium, leachable	7440-39-3	E450A	2.0	mg/kg	33.2	38.0	38.5	46.1	34.4
beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.596	0.625	0.681	0.529	0.491
calcium, leachable	7440-70-2	E450A	50	mg/kg	35300	40700	42500	45900	45300
chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	0.64	0.77	0.90	0.38	0.81
copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450A	5.0	mg/kg	113	108	136	80.7	116
molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450A	2.0	mg/kg	12.6	9.8	12.2	9.2	11.5
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	<50	<50	<50
selenium, leachable	7782-49-2	E450A	0.20	mg/kg	0.26	<0.20	0.22	0.21	0.37
silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450A	5.0	mg/kg	15.6	17.8	18.4	20.4	19.4
thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.281	0.358	0.347	0.376	0.377
vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450A	1.0	mg/kg	19.8	22.7	24.3	17.5	23.2
Easily Reducible Metals and Iron Oxides									
aluminum, leachable	7429-90-5	E450B	50	mg/kg	453	446	410	342	252
antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.414	0.372	0.326	0.260	0.329
barium, leachable	7440-39-3	E450B	0.50	mg/kg	35.7	33.3	30.5	36.1	51.9
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.27	0.26	0.23	0.27	0.21
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
and the second s	7 ++0-03-3	2.002	1 0.20	l marka	.0.20	0.20	1 .0.20	1 .0.20	.0.20

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Sub-Matrix: Soil			C	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	oling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Easily Reducible Metals and Iron Oxides									
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.756	0.590	0.710	0.491	0.956
calcium, leachable	7440-70-2	E450B	50	mg/kg	8090	8500	15800	24300	90200
chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.57	0.71	0.64	0.60	0.51
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	3.39	3.09	3.08	3.62	1.95
copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.53	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450B	50	mg/kg	3150	2760	2610	2260	1550
lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.29	3.44	3.45	3.91	3.82
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	172	208	161	261	128
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	45.7	29.2	42.1	30.9	27.8
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	150	141	122	68	136
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	2.13	1.17	1.56	1.21	2.68
silver, leachable	7440-22-4	E450B	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	6.44	7.23	9.06	11.9	37.2
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.434	0.410	0.408	0.448	0.586
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.04	2.24	2.03	2.00	1.65
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	64.2	57.0	74.5	50.2	67.2
Organic Bound Metals									
aluminum, leachable	7429-90-5	E450C	50	mg/kg	2160	1670	1850	1400	872
antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.718	0.416	0.642	0.450	0.322
barium, leachable	7440-39-3	E450C	0.50	mg/kg	30.5	23.2	38.0	30.5	26.1
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.127	0.082	0.117	0.081	0.084
calcium, leachable	7440-70-2	E450C	50	mg/kg	1630	1500	2020	2110	2530
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	5.19	4.00	4.20	3.55	2.33

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Sub-Matrix: Soil			С	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
			Client samp	oling date / time	12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Organic Bound Metals			2.12						
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.98	1.33	1.78	1.47	1.28
copper, leachable	7440-50-8	E450C	0.50	mg/kg	11.4	6.79	9.62	7.14	6.92
iron, leachable	7439-89-6	E450C	50	mg/kg	3350	2280	2800	2080	1440
lead, leachable	7439-92-1	E450C	0.50	mg/kg	2.05	1.00	1.67	0.74	<0.50
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	18.1	16.2	13.9	14.3	6.7
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	35.6	16.6	30.0	21.3	17.5
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	20.3	8.53	12.9	8.40	11.9
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.82	4.90	5.61	5.42	4.05
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	8.7	18.7	23.4	17.7	13.8
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.545	0.395	0.407	0.324	0.192
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	6.84	5.56	6.02	5.10	3.35
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	17.8	9.1	14.3	8.0	7.0
Residual Metals									
aluminum, leachable	7429-90-5	E450D	50	mg/kg	6660	8330	6440	6640	5550
antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.72	0.70	0.68	0.64	0.56
arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	5.16	<5.00	<5.00	<5.00
barium, leachable	7440-39-3	E450D	2.0	mg/kg	133	134	143	140	86.7
beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.32	0.38	0.28	0.32	0.24
bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.069	0.099	0.063	0.091	0.069
calcium, leachable	7440-70-2	E450D	50	mg/kg	239	732	321	730	721
chromium, leachable	7440-47-3	E450D	5.0	mg/kg	9.9	12.1	9.4	9.7	7.8
cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.18	2.89	2.21	2.58	1.99
copper, leachable	7440-50-8	E450D	0.50	mg/kg	11.7	14.4	11.0	11.9	8.60
iron, leachable	7439-89-6	E450D	50	mg/kg	7770	12200	7930	9990	7510
lead, leachable	7439-99-1	E450D	0.50	mg/kg	5.91	6.82	5.40	5.64	3.21
ioda, iodoriusio	1439-92-1	L-100D	0.50	mg/kg	0.01	0.02] 0.40	3.04	J.21

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Analytical Results

Sub-Matrix: Soil			CI	lient sample ID	RG_GHBP_SE-1	RG_GHBP_SE-2	RG_GHBP_SE-3	RG_GHBP_SE-4	RG_GHBP_SE-5
(Matrix: Soil/Solid)					_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N	_2022-09-12_N
	Client sampling date / tin				12-Sep-2022 08:37	12-Sep-2022 09:55	12-Sep-2022 11:16	12-Sep-2022 12:00	12-Sep-2022 13:45
Analyte	CAS Number	Method	LOR	Unit	CG2212702-001	CG2212702-002	CG2212702-003	CG2212702-004	CG2212702-005
					Result	Result	Result	Result	Result
Residual Metals									
lithium, leachable	7439-93-2	E450D	5.0	mg/kg	<5.0	6.7	<5.0	5.5	<5.0
manganese, leachable	7439-96-5	E450D	5.0	mg/kg	31.7	46.6	31.0	38.5	31.8
molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.89	1.12	0.79	0.88	0.64
nickel, leachable	7440-02-0	E450D	2.0	mg/kg	9.6	12.0	9.4	10.4	8.0
selenium, leachable	7782-49-2	E450D	0.20	mg/kg	3.09	1.80	2.03	1.36	2.01
silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.24	0.16	0.20	0.15	0.11
strontium, leachable	7440-24-6	E450D	5.0	mg/kg	19.4	22.0	18.8	20.5	17.0
thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.174	0.185	0.153	0.157	0.123
tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450D	5.0	mg/kg	14.9	13.3	11.1	11.2	10.2
uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.277	0.348	0.256	0.336	0.251
vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	22.9	27.3	22.0	22.4	17.9
zinc, leachable	7440-66-6	E450D	1.0	mg/kg	50.9	69.2	52.7	58.0	44.7

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

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Sub-Matrix: Soil			С	lient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	oling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Physical Tests									
moisture		E144	0.25	%	42.6	46.9	39.0	48.5	49.8
pH (1:2 soil:water)		E108	0.10	pH units	8.15	8.20	8.16	8.24	8.16
Particle Size									
grain size curve		E185A	-	-	See	See	See Attached	See	See Attached
alou (c0 004mm)		EC4044	1.0	0,	Attached	Attached	44.0	Attached	40.0
clay (<0.004mm)		EC184A	1.0	%	19.7	12.4	14.3	28.2	16.0
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	12.5	14.3	9.0	11.4	11.9
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	32.0	27.3	22.6	42.2	28.6
sand (0.125mm - 0.063mm)		EC184A	1.0	%	7.5	10.7	6.2	4.8	5.9
sand (0.25mm - 0.125mm)		EC184A	1.0	%	12.0	17.3	11.2	6.6	11.4
sand (0.5mm - 0.25mm)		EC184A	1.0	%	9.1	11.5	9.3	3.1	10.3
sand (1.0mm - 0.50mm)		EC184A	1.0	%	5.6	3.8	10.6	2.3	9.4
sand (2.0mm - 1.0mm)		EC184A	1.0	%	1.6	2.2	11.9	1.0	5.4
gravel (>2mm)		EC184A	1.0	%	<1.0	<1.0	4.9	<1.0	1.1
Organic / Inorganic Carbon									
carbon, total [TC]		E351	0.050	%	18.3	15.4	14.0	26.2	20.2
carbon, inorganic [IC]		E354	0.050	%	1.80	2.10	2.47	2.42	2.41
carbon, inorganic [IC], (as CaCO3 equivalent)		E354	0.40	%	15.0	17.5	20.6	20.1	20.1
carbon, total organic [TOC]		EC356	0.050	%	16.5	13.3	11.5	23.8	17.8
Metals									
aluminum	7429-90-5	E440	50	mg/kg	8260	8980	6830	5980	6680
antimony	7440-36-0	E440	0.10	mg/kg	0.75	0.58	0.63	0.68	0.67
arsenic	7440-38-2	E440	0.10	mg/kg	5.56	5.28	4.55	4.24	5.46
barium	7440-39-3	E440	0.50	mg/kg	225	229	212	216	206
beryllium	7440-41-7	E440	0.10	mg/kg	0.70	0.74	0.59	0.59	0.66
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg	8.7	9.0	6.0	<5.0	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg	0.727	0.689	0.681	0.711	0.714
calcium	7440-70-2	E440	50	mg/kg	59300	58600	82100	83100	65600
chromium	7440-47-3	E440	0.50	mg/kg	11.9	12.4	9.78	8.86	9.80
cobalt	7440-48-4	E440	0.10	mg/kg	7.31	7.68	7.02	6.79	8.27

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Work Order : CG2212702
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Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil			CI	lient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	ling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Metals									
copper	7440-50-8	E440	0.50	mg/kg	15.7	14.7	14.4	14.9	16.0
iron	7439-89-6	E440	50	mg/kg	14500	16300	12700	10800	15600
lead	7439-92-1	E440	0.50	mg/kg	10.7	10.7	9.64	9.43	11.1
lithium	7439-93-2	E440	2.0	mg/kg	11.6	12.6	10.5	9.4	11.3
magnesium	7439-95-4	E440	20	mg/kg	3620	3750	3830	3580	3930
manganese	7439-96-5	E440	1.0	mg/kg	380	478	402	346	516
mercury	7439-97-6	E510	0.0050	mg/kg	0.0509	0.0391	0.0448	0.0610	0.0532
molybdenum	7439-98-7	E440	0.10	mg/kg	1.24	1.09	1.09	1.18	1.23
nickel	7440-02-0	E440	0.50	mg/kg	25.4	24.7	23.1	21.9	25.8
phosphorus	7723-14-0	E440	50	mg/kg	976	1010	846	831	1000
potassium	7440-09-7	E440	100	mg/kg	2030	2090	1590	1390	1360
selenium	7782-49-2	E440	0.20	mg/kg	1.54	1.21	1.21	1.31	1.19
silver	7440-22-4	E440	0.10	mg/kg	0.30	0.21	0.24	0.25	0.22
sodium	7440-23-5	E440	50	mg/kg	69	74	70	66	67
strontium	7440-24-6	E440	0.50	mg/kg	64.0	64.9	70.1	72.0	62.9
sulfur	7704-34-9	E440	1000	mg/kg	1100	1100	1500	1600	1200
thallium	7440-28-0	E440	0.050	mg/kg	0.154	0.159	0.131	0.112	0.124
tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg	15.0	14.2	11.6	10.8	11.8
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg	0.815	0.763	0.747	0.751	0.792
vanadium	7440-62-2	E440	0.20	mg/kg	27.5	28.2	22.5	21.2	22.3
zinc	7440-66-6	E440	2.0	mg/kg	90.7	88.5	79.2	78.0	91.8
zirconium	7440-67-7	E440	1.0	mg/kg	<1.0	<1.0	1.2	<1.0	1.0
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.050	mg/kg	0.256	0.138	0.239	0.580	0.508
acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	0.095	0.084
acridine	260-94-6	E641A	0.050	mg/kg	0.429	0.207	0.346	0.905	0.829
anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	0.133	0.051	0.129	0.316	0.299
benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	0.092	<0.050	0.064	0.178	0.163
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Sub-Matrix: Soil			CI	ient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	ling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons		E644A	0.050		0.201	0.440	0.222	0.560	0.544
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.301	0.118	0.223	0.568	0.541
benzo(b+j+k)fluoranthene	n/a	E641A	0.075	mg/kg	0.366	0.118	0.313	0.682	0.762
benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	0.060	<0.050	0.066	0.196	0.213
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	0.065	<0.050	0.090	0.114	0.221
chrysene	218-01-9	E641A	0.050	mg/kg	0.715	0.314	0.552	1.40	1.29
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	0.056	<0.050	<0.050	0.111	0.103
fluoranthene	206-44-0	E641A	0.050	mg/kg	0.114	0.053	0.099	0.246	0.222
fluorene	86-73-7	E641A	0.050	mg/kg	0.615	0.338	0.568	1.40	1.25
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	0.074	0.071
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	3.48	2.13	3.29	7.80	6.97
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	9.82	5.93	9.43	22.3	20.0
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	6.34	3.80	6.14	14.5	13.0
naphthalene	91-20-3	E641A	0.010	mg/kg	2.26	1.50	2.26	5.15	4.66
phenanthrene	85-01-8	E641A	0.050	mg/kg	2.45	1.32	2.24	5.36	4.94
pyrene	129-00-0	E641A	0.050	mg/kg	0.231	0.114	0.200	0.472	0.431
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	0.208	0.075	0.142	0.412	0.394
IACR (CCME)		E641A	0.60	-	3.54	1.39	2.91	6.91	7.23
IACR AB (coarse)		E641A	0.10	-	0.14	<0.10	0.14	0.26	0.34
IACR AB (fine)		E641A	0.10	-	0.27	0.10	0.26	0.50	0.65
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	13.3	7.63	12.5	29.8	27.0
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	7.35	3.95	6.73	16.3	15.0
Polycyclic Aromatic Hydrocarbons Surrogates									
acridine-d9	34749-75-2	E641A	0.1	%	72.6	73.8	72.9	69.6	77.5
chrysene-d12	1719-03-5	E641A	0.1	%	81.2	87.8	87.7	77.7	89.2
naphthalene-d8	1146-65-2	E641A	0.1	%	83.5	91.2	93.0	83.2	96.6
phenanthrene-d10	1517-22-2	E641A	0.1	%	80.0	83.8	85.2	78.4	88.0
Exchangeable & Adsorbed Metals									
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
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Sub-Matrix: Soil			Ci	lient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	oling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Exchangeable & Adsorbed Metals									
barium, leachable	7440-39-3	E450	0.50	mg/kg	22.9	25.9	16.8	20.4	21.0
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.109	0.102	0.112	0.143	0.142
calcium, leachable	7440-70-2	E450	50	mg/kg	3750	3620	3170	3580	4010
chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.26	0.27	0.16	0.23	0.20
copper, leachable	7440-50-8	E450	0.50	mg/kg	1.09	1.05	<0.50	1.04	1.02
iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450	1.0	mg/kg	86.0	94.9	45.3	46.7	53.1
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450	0.50	mg/kg	0.50	0.53	<0.50	<0.50	<0.50
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	<50	<50	<50
potassium, leachable	7440-09-7	E450	100	mg/kg	160	150	<100	160	150
selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	<100	<100	<100
strontium, leachable	7440-24-6	E450	0.50	mg/kg	7.35	7.85	4.94	5.71	6.52
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Carbonate Metals									
aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.088	0.066	<0.050	<0.050	<0.050
barium, leachable	7440-39-3	E450A	2.0	mg/kg	52.8	52.3	50.7	54.0	51.0
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Sub-Matrix: Soil			CI	ient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	ling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Carbonate Metals									
beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.295	0.231	0.232	0.272	0.272
calcium, leachable	7440-70-2	E450A	50	mg/kg	41800	43600	47500	45200	43600
chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	0.92	0.75	0.54	0.71	0.59
copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450A	5.0	mg/kg	104	116	87.2	85.3	98.3
molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450A	2.0	mg/kg	2.1	2.0	<2.0	<2.0	<2.0
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	<50	<50	<50
selenium, leachable	7782-49-2	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450A	5.0	mg/kg	24.9	24.8	25.5	24.9	24.3
thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.168	0.158	0.152	0.148	0.145
vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450A	1.0	mg/kg	6.9	5.3	4.4	4.1	4.5
Easily Reducible Metals and Iron Oxides									
aluminum, leachable	7429-90-5	E450B	50	mg/kg	598	490	431	458	470
antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.536	0.450	0.357	0.366	0.382
barium, leachable	7440-39-3	E450B	0.50	mg/kg	39.3	32.0	47.6	45.0	37.0
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.29	0.28	0.27	0.32	0.29
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.396	0.335	0.306	0.388	0.372
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Sub-Matrix: Soil			CI	ient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	ling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Easily Reducible Metals and Iron Oxides	7440 70 0	E450B	50	ma/lea	7900	10300	28200	30600	17600
calcium, leachable	7440-70-2	E450B	0.50	mg/kg	0.82	0.74	0.91	0.98	0.80
chromium, leachable	7440-47-3			mg/kg	3.44			3.69	3.48
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg		3.28	4.14		
copper, leachable	7440-50-8	E450B	0.50	mg/kg	<0.50	0.52	0.57	0.67	<0.50
iron, leachable	7439-89-6	E450B	50	mg/kg	3580	3220	2990	2980	3020
lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.34	3.30	4.24	4.38	3.57
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	105	146	292	151	179
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	10.0	9.36	10.2	9.97	9.66
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	180	132	61	53	76
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver, leachable	7440-22-4	E450B	0.10	mg/kg	<0.10	<0.10	<0.10	0.11	0.10
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	7.78	8.12	16.9	18.9	11.7
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.191	0.152	0.187	0.190	0.181
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.77	2.36	2.45	2.86	2.42
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	31.3	25.8	26.6	30.7	27.7
Organic Bound Metals									
aluminum, leachable	7429-90-5	E450C	50	mg/kg	1630	1630	1310	1400	1520
antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.460	0.446	0.319	0.495	0.479
barium, leachable	7440-39-3	E450C	0.50	mg/kg	23.6	23.4	22.2	23.3	22.7
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.073	0.067	0.062	0.081	0.077
calcium, leachable	7440-70-2	E450C	50	mg/kg	1220	1410	1840	1990	1740
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.62	3.30	2.56	3.12	3.24
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.02	0.92	0.92	0.83	0.97
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil			С	lient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
			Client samp	oling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Organic Bound Metals	7440 50 0	E450C	0.50	ma/lea	7.33	6.69	5.16	8.19	7.78
copper, leachable	7440-50-8			mg/kg					
iron, leachable	7439-89-6	E450C	50	mg/kg	1970	2030	1520	1560	1860
lead, leachable	7439-92-1	E450C	0.50	mg/kg	1.12	0.88	<0.50	0.64	0.92
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	10.9	13.6	14.3	9.0	11.8
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	5.95	5.73	5.20	5.53	5.96
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	1.55	1.19	0.96	1.21	1.25
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.34	4.67	5.13	5.32	4.84
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	17.1	17.4	1.9	16.4	16.5
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.255	0.233	0.192	0.232	0.235
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.97	4.38	3.45	4.50	4.32
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	7.9	7.3	5.8	7.4	7.9
Residual Metals									
aluminum, leachable	7429-90-5	E450D	50	mg/kg	6540	6910	6860	5760	5490
antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.69	0.62	0.63	0.71	0.63
arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	<5.00	<5.00	<5.00	<5.00
barium, leachable	7440-39-3	E450D	2.0	mg/kg	132	106	110	114	103
beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.31	0.33	0.34	0.31	0.30
bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.075	0.073	0.083	0.064	0.062
calcium, leachable	7440-70-2	E450D	50	mg/kg	423	454	662	313	389
chromium, leachable	7440-47-3	E450D	5.0	mg/kg	9.4	9.7	9.4	8.3	7.8
cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.45	2.54	2.68	2.33	2.19
copper, leachable	7440-50-8	E450D	0.50	mg/kg	12.2	11.1	11.7	11.6	10.7
iron, leachable	7439-89-6	E450D	50	mg/kg	8370	8960	11000	7230	7230
lead, leachable	7439-92-1	E450D	0.50	mg/kg	5.93	5.71	5.57	5.08	5.37
lithium, leachable	7439-93-2	E450D	5.0	mg/kg	5.1	6.2	6.5	<5.0	<5.0
	1400-00-2	2.000	1 3.5	mg/kg	0.1	0.2	1	1 -0.0	٠٠.٥

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Analytical Results

Sub-Matrix: Soil			Cl	ient sample ID	RG_GANF_SE-1	RG_GANF_SE-2	RG_GANF_SE-3	RG_GANF_SE-4	RG_GANF_SE-5
(Matrix: Soil/Solid)					_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N	_2022-09-13_N
				ling date / time	13-Sep-2022 10:20	13-Sep-2022 10:45	13-Sep-2022 11:45	13-Sep-2022 12:30	13-Sep-2022 13:08
Analyte	CAS Number	Method	LOR	Unit	CG2212702-006	CG2212702-007	CG2212702-008	CG2212702-009	CG2212702-010
					Result	Result	Result	Result	Result
Residual Metals									
manganese, leachable	7439-96-5	E450D	5.0	mg/kg	32.5	35.0	44.8	29.6	29.7
molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.81	0.90	0.88	0.82	0.79
nickel, leachable	7440-02-0	E450D	2.0	mg/kg	9.3	9.6	10.0	8.7	8.3
selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.45	0.54	0.46	0.34	0.39
silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.19	0.13	0.12	0.16	0.16
strontium, leachable	7440-24-6	E450D	5.0	mg/kg	20.7	19.2	19.1	20.5	18.9
thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.129	0.128	0.128	0.111	0.102
tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450D	5.0	mg/kg	14.3	16.8	15.1	15.6	12.8
uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.251	0.254	0.302	0.250	0.240
vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	23.3	23.6	23.3	21.5	19.6
zinc, leachable	7440-66-6	E450D	1.0	mg/kg	52.0	52.1	58.4	50.7	47.8

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



QUALITY CONTROL INTERPRETIVE REPORT

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Client : Teck Coal Limited : Calgary - Environmental : Contact : Giovanna Diaz : Calgary - Environmental : Lyudmyla Shvets

Address : 421 Pine Avenue Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

 Telephone
 : -- Telephone
 : +1 403 407 1800

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 15-Sep-2022 08:50

C-O-C number : REP_LAEMP_GC_2022-09_ALS
Sampler : JI

Sparwood BC Canada V0B2G0

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 10
No. of samples analysed : 10

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Duplicate outliers occur please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

• No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

• No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.



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Client : Teck Coal Limited

: REGIONAL EFFECTS PROGRAM Project



Outliers: Quality Control Samples
Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: Soil/Solid

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Duplicate (DUP) RPDs								
Easily Reducible Metals and Iron Oxides	CG2212702-007	RG_GANF_SE-2_202 2-09-13_N	calcium, leachable	7440-70-2	E450B	46.9 % ^{DUP-H}	30%	Duplicate RPD does not meet the DQO for this test.
Easily Reducible Metals and Iron Oxides	CG2212702-007	RG_GANF_SE-2_202 2-09-13_N	strontium, leachable	7440-24-6	E450B	33.4 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.

Result Qualifiers

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.

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Analysis Holding Time Compliance

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

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

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

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

/latrix: Soil/Soild					E\	/aluation. 🔻 –	Holding time excee	edance,	- vvitriiri	nolaling i
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holdin	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag										
RG_GANF_SE-1_2022-09-13_N	E450A	13-Sep-2022	08-Oct-2022	180	25	✓	09-Oct-2022	155	1 days	✓
				days	days			days		
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag						_				
RG_GANF_SE-2_2022-09-13_N	E450A	13-Sep-2022	08-Oct-2022	180	25	✓	09-Oct-2022	155	1 days	✓
				days	days			days		
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag									l	
RG_GANF_SE-3_2022-09-13_N	E450A	13-Sep-2022	08-Oct-2022	180	25	✓	09-Oct-2022	155	1 days	✓
				days	days			days		
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag	E450A	40.0 0000	00.0.4.0000							
RG_GANF_SE-4_2022-09-13_N	E450A	13-Sep-2022	08-Oct-2022	180	25	✓	09-Oct-2022	155	1 days	✓
				days	days			days		
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)						I				
LDPE bag	E450A	13-Sep-2022	08-Oct-2022			✓	09-Oct-2022		1 days	√
RG_GANF_SE-5_2022-09-13_N	E430A	13-3ep-2022	06-OCI-2022	180	25	Y	09-001-2022	155 days	Tuays	•
				days	days			uays		
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)								I		
LDPE bag RG GHBP SE-1 2022-09-12 N	E450A	12-Sep-2022	08-Oct-2022	180	26	✓	09-Oct-2022	154	1 days	√
KG_GHBP_SE-1_2022-09-12_N	L430A	12-3ep-2022	06-OCI-2022	days	26 days	Y	09-001-2022	days	Tuays	•
				uays	uays			uays		
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag RG GHBP SE-2 2022-09-12 N	E450A	12-Sep-2022	08-Oct-2022	180	26	✓	09-Oct-2022	154	1 days	√
1/Q_GLIDF_9E-2_2022-09-12_IV	L430A	12-06p-2022	00-001-2022		_	•	09-06-2022	days	luays	•
				days	days			uays		

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 : Teck Coal Limited

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iaurix: Soii/Soild							Holding time excee			
Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag										
RG_GHBP_SE-3_2022-09-12_N	E450A	12-Sep-2022	08-Oct-2022	180	26	✓	09-Oct-2022	154	1 days	✓
				days	days			days		
arbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag										
RG_GHBP_SE-4_2022-09-12_N	E450A	12-Sep-2022	08-Oct-2022	180	26	✓	09-Oct-2022	154	1 days	✓
				days	days			days		
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
LDPE bag										
RG_GHBP_SE-5_2022-09-12_N	E450A	12-Sep-2022	08-Oct-2022	180	26	✓	09-Oct-2022	154	1 days	✓
		· ·		days	days			days		
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #2\			,	,			,		
LOPE bag	011 #3)						I			
RG_GANF_SE-1_2022-09-13_N	E450B	13-Sep-2022	11-Oct-2022	180	28	✓	12-Oct-2022	152	1 days	1
NO_0/111 _0E=1_2022-03=10_11	2.002	10 COP 2022	11 000 2022	days	days	·	12 000 2022	days	, adyo	•
				days	days			days		
asily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)							I		
LDPE bag	E450B	13-Sep-2022	11-Oct-2022	400		✓	12-Oct-2022	450	1 days	√
RG_GANF_SE-2_2022-09-13_N	E450B	13-Sep-2022	11-Oct-2022	180	28	•	12-UCI-2022	152	1 days	•
				days	days			days		
asily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)									
LDPE bag						,				,
RG_GANF_SE-3_2022-09-13_N	E450B	13-Sep-2022	11-Oct-2022	180	28	✓	12-Oct-2022	152	1 days	✓
				days	days			days		
asily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)									
LDPE bag										
RG_GANF_SE-4_2022-09-13_N	E450B	13-Sep-2022	11-Oct-2022	180	28	✓	12-Oct-2022	152	1 days	✓
				days	days			days		
asily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)									
LDPE bag										
RG_GANF_SE-5_2022-09-13_N	E450B	13-Sep-2022	11-Oct-2022	180	28	✓	12-Oct-2022	152	1 days	✓
				days	days			days		
asily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)							1		
LDPE bag										
G .	E 450D	40.0 0000	11-Oct-2022	100		✓	12-Oct-2022	151	1 days	1
RG_GHBP_SE-1_2022-09-12_N	E450B	12-Sep-2022	11-061-2022	180	29		12-061-2022	101	I uays	

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Client : Teck Coal Limited



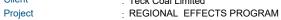


Analyte Group	Method	Sampling Date	Ex	traction / Pi			Analysis			
Container / Client Sample ID(s)		J 2000 pm 19 2 2002	Preparation		g Times	Eval	Analysis Date	Holdin	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	on #3)									
LDPE bag RG_GHBP_SE-2_2022-09-12_N	E450B	12-Sep-2022	11-Oct-2022	180 days	29 days	✓	12-Oct-2022	151 days	1 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	n #3)			days	days			days		
LDPE bag	JII #3)									
RG_GHBP_SE-3_2022-09-12_N	E450B	12-Sep-2022	11-Oct-2022	180 days	29 days	✓	12-Oct-2022	151 days	1 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	on #3)									
LDPE bag RG_GHBP_SE-4_2022-09-12_N	E450B	12-Sep-2022	11-Oct-2022	180 days	29 days	✓	12-Oct-2022	151 days	1 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	on #3)									
LDPE bag RG_GHBP_SE-5_2022-09-12_N	E450B	12-Sep-2022	11-Oct-2022	180 days	29 days	✓	12-Oct-2022	151 days	1 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
RG_GANF_SE-1_2022-09-13_N	E450	13-Sep-2022	07-Oct-2022	180 days	24 days	✓	10-Oct-2022	156 days	3 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
LDPE bag RG_GANF_SE-2_2022-09-13_N	E450	13-Sep-2022	07-Oct-2022	180 days	24 days	✓	10-Oct-2022	156 days	3 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
LDPE bag RG_GANF_SE-3_2022-09-13_N	E450	13-Sep-2022	07-Oct-2022	180 days	24 days	✓	10-Oct-2022	156 days	3 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
LDPE bag RG_GANF_SE-4_2022-09-13_N	E450	13-Sep-2022	07-Oct-2022	180 days	24 days	✓	10-Oct-2022	156 days	3 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
LDPE bag RG_GANF_SE-5_2022-09-13_N	E450	13-Sep-2022	07-Oct-2022	180 days	24 days	✓	10-Oct-2022	156 days	3 days	✓

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 Work Order
 : CG2212702

Client : Teck Coal Limited





Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analysis				
Container / Client Sample ID(s)		, 3	Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval		
			Date	Rec	Actual			Rec	Actual			
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)												
LDPE bag RG_GHBP_SE-1_2022-09-12_N	E450	12-Sep-2022	07-Oct-2022	180	25	✓	10-Oct-2022	155	3 days	✓		
				days	days			days	-			
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)												
LDPE bag	E 450	40.0 0000				,				,		
RG_GHBP_SE-2_2022-09-12_N	E450	12-Sep-2022	07-Oct-2022	180 days	25 days	✓	10-Oct-2022	155 days	3 days	✓		
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)												
LDPE bag						,						
RG_GHBP_SE-3_2022-09-12_N	E450	12-Sep-2022	07-Oct-2022	180 days	25 days	✓	10-Oct-2022	155 days	3 days	✓		
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)												
LDPE bag												
RG_GHBP_SE-4_2022-09-12_N	E450	12-Sep-2022	07-Oct-2022	180 days	25 days	✓	10-Oct-2022	155 days	3 days	✓		
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)												
LDPE bag						,						
RG_GHBP_SE-5_2022-09-12_N	E450	12-Sep-2022	07-Oct-2022	180 days	25 days	✓	10-Oct-2022	155 days	3 days	✓		
Metals : Mercury in Soil/Solid by CVAAS												
LDPE bag										,		
RG_GANF_SE-1_2022-09-13_N	E510	13-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	7 days	✓		
Metals : Mercury in Soil/Solid by CVAAS												
LDPE bag	5540	40.0 0000								,		
RG_GANF_SE-2_2022-09-13_N	E510	13-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	7 days	✓		
Metals : Mercury in Soil/Solid by CVAAS												
LDPE bag												
RG_GANF_SE-3_2022-09-13_N	E510	13-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	7 days	✓		
Metals : Mercury in Soil/Solid by CVAAS												
LDPE bag	E510	13-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	7 days	√		
RG_GANF_SE-4_2022-09-13_N	E310	13-3ep-2022	20-3ep-2022				20-Sep-2022	28 days	r days	•		

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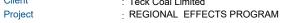




Matrix: Soil/Soild		aluation. * -	1. * - Holding time exceedance , * - within Holding							
Analyte Group	Method	Sampling Date	Ex	traction / P	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag										
RG_GANF_SE-5_2022-09-13_N	E510	13-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	7 days	✓
									-	
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag										
RG GHBP SE-1 2022-09-12 N	E510	12-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	8 days	✓
NO_011b1 _0E-1_2022-03-12_IV	2010	12 Gop 2022	20-00p-2022				20 OCP 2022	20 days	o days	·
Metals : Mercury in Soil/Solid by CVAAS								T	l I	
LDPE bag	E510	12-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	O daya	✓
RG_GHBP_SE-2_2022-09-12_N	E310	12-Sep-2022	20-Sep-2022				20-Sep-2022	20 days	o days	•
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag										
RG_GHBP_SE-3_2022-09-12_N	E510	12-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	8 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag										
RG_GHBP_SE-4_2022-09-12_N	E510	12-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	8 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
LDPE bag										
RG_GHBP_SE-5_2022-09-12_N	E510	12-Sep-2022	20-Sep-2022				20-Sep-2022	28 days	8 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag										
RG_GANF_SE-1_2022-09-13_N	E440	13-Sep-2022	20-Sep-2022				20-Sep-2022	180	7 days	1
								days	,-	
Madela e Madela in California has CDC ICDMC										
Metals : Metals in Soil/Solid by CRC ICPMS							I			
LDPE bag RG GANF SE-2 2022-09-13 N	E440	13-Sep-2022	20-Sep-2022				20-Sep-2022	400	7 days	1
RG_GANF_SE-2_2022-09-13_N	E440	13-3ep-2022	20-3ep-2022				20-3ep-2022	180	7 uays	•
							L	days		
Metals : Metals in Soil/Solid by CRC ICPMS										
LDPE bag										
RG_GANF_SE-3_2022-09-13_N	E440	13-Sep-2022	20-Sep-2022				20-Sep-2022	180	7 days	✓
								days		

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Client : Teck Coal Limited





Matrix: 3011/30110						diddion. *-	- Holding time exceedance , V - Within Holdin				
Analyte Group	Method	Sampling Date	Ex	traction / P	reparation			Analys	sis		
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval	
			Date	Rec	Actual			Rec	Actual		
Metals : Metals in Soil/Solid by CRC ICPMS											
LDPE bag											
RG_GANF_SE-4_2022-09-13_N	E440	13-Sep-2022	20-Sep-2022				20-Sep-2022	180	7 days	✓	
								days			
Metals : Metals in Soil/Solid by CRC ICPMS											
LDPE bag											
RG GANF SE-5 2022-09-13 N	E440	13-Sep-2022	20-Sep-2022				20-Sep-2022	180	7 days	1	
110_0,111 _02 0_2022 00 10_11		10 234 2022	20 000 2022				20 000 2022	days	,		
M (III M (III II O III O III O O III O O III O											
Metals : Metals in Soil/Solid by CRC ICPMS							I				
LDPE bag RG_GHBP_SE-1_2022-09-12_N	E440	12-Sep-2022	20-Sep-2022				20-Sep-2022	400	8 days	√	
RG_GHBP_SE-1_2022-09-12_N	E440	12-3ep-2022	20-3ep-2022				20-3ep-2022	180	o uays	•	
								days			
Metals : Metals in Soil/Solid by CRC ICPMS		_									
LDPE bag										,	
RG_GHBP_SE-2_2022-09-12_N	E440	12-Sep-2022	20-Sep-2022				20-Sep-2022	180	8 days	✓	
								days			
Metals : Metals in Soil/Solid by CRC ICPMS											
LDPE bag											
RG_GHBP_SE-3_2022-09-12_N	E440	12-Sep-2022	20-Sep-2022				20-Sep-2022	180	8 days	✓	
								days			
Metals : Metals in Soil/Solid by CRC ICPMS											
LDPE bag											
RG_GHBP_SE-4_2022-09-12_N	E440	12-Sep-2022	20-Sep-2022				20-Sep-2022	180	8 days	✓	
								days			
Metals : Metals in Soil/Solid by CRC ICPMS											
LDPE bag											
RG_GHBP_SE-5_2022-09-12_N	E440	12-Sep-2022	20-Sep-2022				20-Sep-2022	180	8 days	✓	
NO_01151 _02 0_2022 00 12_1V			20 000 2022				20 000 2022	days	o days		
0 m 1 H 2 m 1 0 1 m 7 (10 1 m 1 0 m 1 m)								dayo			
Organic / Inorganic Carbon : Total Carbon by Combustion											
LDPE bag	E351	13-Sep-2022	23-Sep-2022				23-Sep-2022	400	0 days	1	
RG_GANF_SE-1_2022-09-13_N	E351	13-3ep-2022	23-3 e p-2022				23-3 e p-2022	180	o days	*	
								days			
Organic / Inorganic Carbon : Total Carbon by Combustion											
LDPE bag											
RG_GANF_SE-2_2022-09-13_N	E351	13-Sep-2022	23-Sep-2022				23-Sep-2022	180	0 days	✓	
								days			

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analyte Group	Method	Sampling Date	Ex	traction / Pr			J	Analysis				
Container / Client Sample ID(s)		J 2000 p 2000	Preparation	Holding	Times	Eval	Analysis Date	Holdin	g Times	Eval		
			Date	Rec	Actual		_	Rec	Actual			
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GANF_SE-3_2022-09-13_N	E351	13-Sep-2022	23-Sep-2022				23-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GANF_SE-4_2022-09-13_N	E351	13-Sep-2022	23-Sep-2022				23-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GANF_SE-5_2022-09-13_N	E351	13-Sep-2022	23-Sep-2022				23-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion									'			
LDPE bag RG_GHBP_SE-1_2022-09-12_N	E351	12-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	0 days	√		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GHBP_SE-2_2022-09-12_N	E351	12-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GHBP_SE-3_2022-09-12_N	E351	12-Sep-2022	21-Sep-2022				21-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GHBP_SE-4_2022-09-12_N	E351	12-Sep-2022	23-Sep-2022				23-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Carbon by Combustion												
LDPE bag RG_GHBP_SE-5_2022-09-12_N	E351	12-Sep-2022	23-Sep-2022				23-Sep-2022	180 days	0 days	✓		
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard	Curve											
LDPE bag RG_GANF_SE-1_2022-09-13_N	E354	13-Sep-2022					22-Sep-2022					

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analyte Group Container / Client Sample ID(s) Method Sampling Date	Extr Preparation	raction / Pr	eparation			Analys	is		
Container / Client Sample ID(s)	Preparation					Analysis			
	, reparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval	
	Date	Rec	Actual			Rec	Actual		
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GANF_SE-2_2022-09-13_N E354 13-Sep-2022					22-Sep-2022				
11521111 2-3 22113 10 1021					, ,				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve						I			
LDPE bag					00.0				
RG_GANF_SE-3_2022-09-13_N E354 13-Sep-2022					22-Sep-2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GANF_SE-4_2022-09-13_N E354 13-Sep-2022					22-Sep-2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GANF_SE-5_2022-09-13_N E354 13-Sep-2022					22-Sep-2022				
102-01-102-01-102-102-102-102-102-102-10									
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve		I				I			
LDPE bag									
RG_GHBP_SE-1_2022-09-12_N E354 12-Sep-2022					22-Sep-2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GHBP_SE-2_2022-09-12_N E354 12-Sep-2022					22-Sep-2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GHBP_SE-3_2022-09-12_N E354 12-Sep-2022					22-Sep-2022				
10_G/ISI_02_0_222_05/12_14					22 00p 2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GHBP_SE-4_2022-09-12_N E354 12-Sep-2022					22-Sep-2022				
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard Curve									
LDPE bag									
RG_GHBP_SE-5_2022-09-12_N E354 12-Sep-2022					22-Sep-2022				

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Matrix:		

Evaluation: 🗴 = F	Holding time exceedance ;	✓ = Within Holding Time
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Proparation Proparation Proparation Proparation Proparation Proparation Proparation Proparation Proparation Proparation Propagation	attix. Soli/Solia			Evaluation.					- Tiolaing time exceedance, within			
Defe Rec Actual Rec Actual Rec Actual Rec Actual Rec Actual	Analyte Group	Method	Sampling Date	ate Extraction / Preparation				Analys	sis			
Patro Patr	Container / Client Sample ID(s)			Preparation	Holdine	g Times	Eval	Analysis Date	Holding	g Times	Eval	
DPE bag Factor				•		_		1	Rec	Actual		
RG_GANF_SE-1_2022-09-13_N	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
Capacid Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) E450C 13-Sep-2022 12-Oct-2022 180 29 49 13-Oct-2022 151 1 days 4	LDPE bag											
### ### ##############################	RG_GANF_SE-1_2022-09-13_N	E450C	13-Sep-2022	12-Oct-2022	180	29	✓	13-Oct-2022	151	1 days	✓	
DPE bag RG_GANF_SE-2_2022-09-13_N					days	days			days			
RG_GANF_SE-2_2022-09-13_N	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
days days	LDPE bag											
Paper Pape	RG_GANF_SE-2_2022-09-13_N	E450C	13-Sep-2022	12-Oct-2022	180	29	✓	13-Oct-2022	151	1 days	✓	
E450C 13-Sep-2022 12-Oct-2022 180 29					days	days			days			
RG_GANF_SE-3_2022-09-13_N	rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)									'		
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GANF_SE-4_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 29 4 13-Oct-2022 151 1 days rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GANF_SE-6_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 29 4 13-Oct-2022 151 1 days rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-1_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 40 30 40 30 40 40 40 40 40 40 40 40 40 40 40 40 40	LDPE bag											
Page Page	RG_GANF_SE-3_2022-09-13_N	E450C	13-Sep-2022	12-Oct-2022	180	29	✓	13-Oct-2022	151	1 days	✓	
E450C 13-Sep-2022 12-Oct-2022 180 29					days	days			days			
RG_GANF_SE-4_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 days 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 151 1 days ✓ rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GANF_SE-5_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 days 12-Oct-2022 180 days 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 13-Oct-2022 151 days ✓ 13-Oct-2022 152-Oct-2022 153 days ✓ 13-Oct-2022 154 days ✓ 13-Oct-2022 155 days ✓ 13-Oct-2022 155 days ✓ 13-Oct-2022 156 days ✓ 13-Oct-2022 157 158 158 158 158 158 158 158	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
rganic Bound Motals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GANF_SE-5_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 29 40 4ays 13-Oct-2022 151 1 days rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-1_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 40 30 40 30 40 30 40 40 40 40 40 40 40 40 40 40 40 40 40	LDPE bag											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GANF_SE-5_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180 29	RG_GANF_SE-4_2022-09-13_N	E450C	13-Sep-2022	12-Oct-2022	180	29	✓	13-Oct-2022	151	1 days	✓	
E450C 13-Sep-2022 12-Oct-2022 180 29 30 30 40 30 40 30 40 30 40 4					days	days			days			
RG_GANF_SE-5_2022-09-13_N E450C 13-Sep-2022 12-Oct-2022 180	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-1_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 4398	LDPE bag											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-1_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-2_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓	RG_GANF_SE-5_2022-09-13_N	E450C	13-Sep-2022	12-Oct-2022	180	29	✓	13-Oct-2022	151	1 days	✓	
## Page 12					days	days			days			
RG_GHBP_SE-1_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 √ 13-Oct-2022 150 days ✓ rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-2_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 days ✓ 13-Oct-2022 150 1 days ✓	rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-2_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180	LDPE bag											
rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-2_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 √ 13-Oct-2022 150 1 days ✓ 150 days 1 days ✓	RG_GHBP_SE-1_2022-09-12_N	E450C	12-Sep-2022	12-Oct-2022	180	30	✓	13-Oct-2022	150	1 days	✓	
E450C 12-Sep-2022 12-Oct-2022 180 30					days	days			days			
RG_GHBP_SE-2_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 days ✓ 13-Oct-2022 150 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag E450C 12-Sep-2022 12-Oct-2022 180 days 30 days ✓ 13-Oct-2022 150 days ✓ rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 days ✓ 13-Oct-2022 150 days ✓	rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 days 13-Oct-2022 150 1 days rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 days 13-Oct-2022 150 1 days ✓ 13-Oct-2022 150 1 days	LDPE bag											
rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 days 13-Oct-2022 150 1 days ✓ rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 days ✓ 13-Oct-2022 150 1 days ✓	RG_GHBP_SE-2_2022-09-12_N	E450C	12-Sep-2022	12-Oct-2022	180	30	✓	13-Oct-2022	150	1 days	✓	
LOPE bag RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 days ✓ 13-Oct-2022 150 days ✓ rganic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 I days ✓ RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 I days ✓					days	days			days			
RG_GHBP_SE-3_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 days 30 √ 13-Oct-2022 150 days ✓ 14dys ✓ 150 days ✓	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓	LDPE bag											
rganic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4) LDPE bag RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓	RG_GHBP_SE-3_2022-09-12_N	E450C	12-Sep-2022	12-Oct-2022	180	30	✓	13-Oct-2022	150	1 days	✓	
LDPE bag E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓					days	days			days			
RG_GHBP_SE-4_2022-09-12_N E450C 12-Sep-2022 12-Oct-2022 180 30 ✓ 13-Oct-2022 150 1 days ✓	Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)											
100 100 100 100 100 100 100 100 100 100	LDPE bag											
days days days	RG_GHBP_SE-4_2022-09-12_N	E450C	12-Sep-2022	12-Oct-2022	180	30	✓	13-Oct-2022	150	1 days	✓	
					days	days			days			

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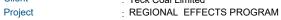




Analyte Group	Method	Sampling Date	ate Extraction / Preparation					Analys		
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
LDPE bag RG_GHBP_SE-5_2022-09-12_N	E450C	12-Sep-2022	12-Oct-2022	180 days	30 days	✓	13-Oct-2022	150 days	1 days	✓
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method									1	
LDPE bag RG_GANF_SE-1_2022-09-13_N	E185A	13-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
RG_GANF_SE-2_2022-09-13_N	E185A	13-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag RG_GANF_SE-3_2022-09-13_N	E185A	13-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag RG_GANF_SE-4_2022-09-13_N	E185A	13-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
RG_GANF_SE-5_2022-09-13_N	E185A	13-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag RG_GHBP_SE-1_2022-09-12_N	E185A	12-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag RG_GHBP_SE-2_2022-09-12_N	E185A	12-Sep-2022					23-Sep-2022	365 days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
RG_GHBP_SE-3_2022-09-12_N	E185A	12-Sep-2022					23-Sep-2022	365 days		

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Matrix: Soil/Solid	Evaluation: × = Holding time exceedance; v = Within Holding										
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation			Analys	sis		
Container / Client Sample ID(s)			Preparation Date	Holdin Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method								ı			
LDPE bag RG_GHBP_SE-4_2022-09-12_N	E185A	12-Sep-2022					23-Sep-2022	365 days			
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method								I.			
LDPE bag RG_GHBP_SE-5_2022-09-12_N	E185A	12-Sep-2022					23-Sep-2022	365 days			
Physical Tests : Moisture Content by Gravimetry											
LDPE bag RG_GANF_SE-1_2022-09-13_N	E144	13-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry							1	l			
LDPE bag RG_GANF_SE-2_2022-09-13_N	E144	13-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry											
LDPE bag RG_GANF_SE-3_2022-09-13_N	E144	13-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry											
LDPE bag RG_GANF_SE-4_2022-09-13_N	E144	13-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry								<u> </u>			
LDPE bag RG_GANF_SE-5_2022-09-13_N	E144	13-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry								1			
LDPE bag RG_GHBP_SE-1_2022-09-12_N	E144	12-Sep-2022					19-Sep-2022				
Physical Tests : Moisture Content by Gravimetry				<u> </u>							
LDPE bag RG_GHBP_SE-2_2022-09-12_N	E144	12-Sep-2022					19-Sep-2022				

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			- Holding time exceedance , V - Within Holding T							
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : Moisture Content by Gravimetry										
LDPE bag										
RG_GHBP_SE-3_2022-09-12_N	E144	12-Sep-2022					19-Sep-2022			
Physical Tests : Moisture Content by Gravimetry										
LDPE bag										
RG GHBP SE-4 2022-09-12 N	E144	12-Sep-2022					19-Sep-2022			
		' '								
Physical Tasta Maister Contact by Consideration										
Physical Tests : Moisture Content by Gravimetry					l		I	I		
LDPE bag RG_GHBP_SE-5_2022-09-12_N	E144	12-Sep-2022					19-Sep-2022			
KG_GHBP_SE-5_2022-09-12_N	E144	12-3ep-2022					19-3ep-2022			
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)				1				1		
LDPE bag										,
RG_GANF_SE-1_2022-09-13_N	E108	13-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag										
RG_GANF_SE-2_2022-09-13_N	E108	13-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag										
RG_GANF_SE-3_2022-09-13_N	E108	13-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	7 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
LDPE bag										
RG_GANF_SE-4_2022-09-13_N	E108	13-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	7 davs	1
							, ,	,	1	
Dhysical Tasta , all by Mater (4:2 Sail-Mater Entraction)							1			
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)							I			
LDPE bag RG GANF SE-5 2022-09-13 N	E108	13-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	7 days	√
110_GANI_SL-3_2022-03-13_IN	L 100	13-36p-2022	20-06p-2022				20-06p-2022	50 days	r uays	•
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)							ı			
LDPE bag	5100	40.0	00.0				00.0			,
RG_GHBP_SE-1_2022-09-12_N	E108	12-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	୪ days	✓

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Matrix: Soil/Solid		Evaluation: * = Holding time exceedance; * = Within Hold									
Analyte Group	Method	Sampling Date	Ex	traction / Pr	reparation			Analys	is		
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval	
			Date	Rec	Actual			Rec	Actual		
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)											
LDPE bag											
RG_GHBP_SE-2_2022-09-12_N	E108	12-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	8 days	✓	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)											
LDPE bag											
RG_GHBP_SE-3_2022-09-12_N	E108	12-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	8 days	✓	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)											
LDPE bag											
RG_GHBP_SE-4_2022-09-12_N	E108	12-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	8 days	✓	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)											
LDPE bag											
RG_GHBP_SE-5_2022-09-12_N	E108	12-Sep-2022	20-Sep-2022				20-Sep-2022	30 days	8 days	✓	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS											
Glass soil jar/Teflon lined cap											
RG_GANF_SE-1_2022-09-13_N	E641A	13-Sep-2022	19-Sep-2022	14	6 days	✓	20-Sep-2022	40 days	1 days	✓	
				days							
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS											
Glass soil jar/Teflon lined cap											
RG_GANF_SE-2_2022-09-13_N	E641A	13-Sep-2022	19-Sep-2022	14	6 days	✓	20-Sep-2022	40 days	1 days	✓	
				days							
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS											
Glass soil jar/Teflon lined cap											
RG_GANF_SE-3_2022-09-13_N	E641A	13-Sep-2022	19-Sep-2022	14	6 days	✓	20-Sep-2022	40 days	1 days	✓	
				days							
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS											
Glass soil jar/Teflon lined cap											
RG_GANF_SE-4_2022-09-13_N	E641A	13-Sep-2022	19-Sep-2022	14	6 days	✓	20-Sep-2022	40 days	1 days	✓	
				days							
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS											
Glass soil jar/Teflon lined cap											
RG_GANF_SE-5_2022-09-13_N	E641A	13-Sep-2022	19-Sep-2022	14	6 days	✓	20-Sep-2022	40 days	1 days	✓	
				days							

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Matrix: Soli/Solid						aldation. • -	Holding time exce	cuarioc ,	- vvicinii	riolaling rill
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation		Analysis			
Container / Client Sample ID(s)			Preparation	eparation Holding Times		Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap										
RG_GHBP_SE-1_2022-09-12_N	E641A	12-Sep-2022	19-Sep-2022	14	7 days	✓	20-Sep-2022	40 days	1 days	✓
				days						
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS									1	
Glass soil jar/Teflon lined cap										
RG_GHBP_SE-2_2022-09-12_N	E641A	12-Sep-2022	19-Sep-2022	14	7 days	✓	20-Sep-2022	40 days	1 days	✓
				days						
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap										
RG_GHBP_SE-3_2022-09-12_N	E641A	12-Sep-2022	19-Sep-2022	14	7 days	✓	20-Sep-2022	40 days	1 days	✓
				days						
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS									1	
Glass soil jar/Teflon lined cap										
RG_GHBP_SE-4_2022-09-12_N	E641A	12-Sep-2022	19-Sep-2022	14	7 days	✓	20-Sep-2022	40 days	1 days	✓
				days						
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap										
RG_GHBP_SE-5_2022-09-12_N	E641A	12-Sep-2022	19-Sep-2022	14	7 days	✓	20-Sep-2022	40 days	1 days	✓
				days						
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)									1	
LDPE bag										
RG_GANF_SE-2_2022-09-13_N	E450D	13-Sep-2022	13-Oct-2022	180	30	✓	14-Oct-2022	150	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										
RG_GANF_SE-3_2022-09-13_N	E450D	13-Sep-2022	13-Oct-2022	180	30	✓	14-Oct-2022	150	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										
RG_GANF_SE-4_2022-09-13_N	E450D	13-Sep-2022	13-Oct-2022	180	30	✓	14-Oct-2022	150	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)				_	-					
LDPE bag										
RG_GANF_SE-5_2022-09-13_N	E450D	13-Sep-2022	13-Oct-2022	180	30	✓	14-Oct-2022	150	0 days	✓
								1 7 7		

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Matrix: Soil/Solid

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

atrix: Soil/Soild					E/	/aiuation: 🗴 =	Holding time excee	edance;	= vvitnin	Holaing
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eva
			Date	Rec	Actual			Rec	Actual	
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										
RG_GHBP_SE-3_2022-09-12_N	E450D	12-Sep-2022	13-Oct-2022	180	31	✓	14-Oct-2022	149	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										
RG_GHBP_SE-4_2022-09-12_N	E450D	12-Sep-2022	13-Oct-2022	180	31	✓	14-Oct-2022	149	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										
RG_GHBP_SE-5_2022-09-12_N	E450D	12-Sep-2022	13-Oct-2022	180	31	✓	14-Oct-2022	149	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag										,
RG_GANF_SE-1_2022-09-13_N	E450D	13-Sep-2022	13-Oct-2022	180	31	✓	14-Oct-2022	150	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag	EAFOR	10.0 0000	40.0.4.0000				44.0 4.000			,
RG_GHBP_SE-1_2022-09-12_N	E450D	12-Sep-2022	13-Oct-2022	180	32	✓	14-Oct-2022	148	0 days	✓
				days	days			days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
LDPE bag	E 450B	40.0 0000	40.0 4.0000				14.0 4.000			,
RG_GHBP_SE-2_2022-09-12_N	E450D	12-Sep-2022	13-Oct-2022	180	32	✓	14-Oct-2022	148	0 days	✓
				days	days			days		

Legend & Qualifier Definitions

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			С	ount		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)								
Mercury in Soil/Solid by CVAAS	E510	655189	1	16	6.2	5.0	1	
Metals by CRC ICPMS (Tessier Extraction #1)	E450	686843	1	10	10.0	5.0	1	
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	687058	1	10	10.0	5.0	<u>-</u>	
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	690795	1	10	10.0	5.0	1	
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	693060	1	10	10.0	5.0	<u>-</u>	
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	695138	1	10	10.0	5.0	√	
Metals in Soil/Solid by CRC ICPMS	E440	655190	1	16	6.2	5.0	√	
Moisture Content by Gravimetry	E144	653383	1	16	6.2	5.0	<u>-</u>	
PAHs by Hex:Ace GC-MS	E641A	653382	1	16	6.2	5.0	√	
pH by Meter (1:2 Soil:Water Extraction)	E108	655392	1	20	5.0	5.0	<u>-</u>	
Total Carbon by Combustion	E351	658653	2	40	5.0	5.0	<u>√</u>	
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	659640	3	41	7.3	5.0	1	
Laboratory Control Samples (LCS)							_	
Mercury in Soil/Solid by CVAAS	E510	655189	2	16	12.5	10.0	1	
Metals by CRC ICPMS (Tessier Extraction #1)	E450	686843	1	10	10.0	5.0	√	
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	687058	1	10	10.0	5.0		
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	690795	1	10	10.0	5.0	√	
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	693060	1	10	10.0	5.0	1	
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	695138	1	10	10.0	5.0	√	
Metals in Soil/Solid by CRC ICPMS	E440	655190	2	16	12.5	10.0	√	
Moisture Content by Gravimetry	E144	653383	1	16	6.2	5.0	<u>√</u>	
PAHs by Hex:Ace GC-MS	E641A	653382	1	16	6.2	5.0	1	
pH by Meter (1:2 Soil:Water Extraction)	E108	655392	2	20	10.0	10.0	1	
Total Carbon by Combustion	E351	658653	4	40	10.0	10.0	√	
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	659640	6	41	14.6	10.0	√	
Method Blanks (MB)								
Mercury in Soil/Solid by CVAAS	E510	655189	1	16	6.2	5.0	1	
Metals by CRC ICPMS (Tessier Extraction #1)	E450	686843	1	10	10.0	5.0	<u> </u>	
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	687058	1	10	10.0	5.0	√	
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	690795	1	10	10.0	5.0	√	
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	693060	1	10	10.0	5.0	1	
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	695138	1	10	10.0	5.0	✓	
Metals in Soil/Solid by CRC ICPMS	E440	655190	1	16	6.2	5.0	<u> </u>	
Moisture Content by Gravimetry	E144	653383	1	16	6.2	5.0	√	
PAHs by Hex:Ace GC-MS	E641A	653382	1	16	6.2	5.0	✓	
Total Carbon by Combustion	E351	658653	2	40	5.0	5.0	√	
, -					1			

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Matrix: Soil/Solid	Evaluation	n: × = QC frequency outside specification; ✓ = QC frequency within specification.					
Quality Control Sample Type		Count	Frequency (%)				

anity Control Sample Type				arit	riequelicy (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS)							
PAHs by Hex:Ace GC-MS	E641A	653382	1	16	6.2	5.0	✓

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Calgary - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 Calgary - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Grain Size Report (Attachment) Pipet/Sieve Method	E185A Saskatoon - Environmental	Soil/Solid	SSIR-51 Method 3.2.1	A grain size curve is a graphical representation of the particle sizing of a sample representing the percent passing against the effective particle size.
Total Carbon by Combustion	E351 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2 (mod)	Total Carbon is determined by the high temperature combustion method with measurement by an infrared detector.
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined by acetic acid pH standard curve, where a known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.
Metals in Soil/Solid by CRC ICPMS	E440 Calgary - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCI. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.

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Client : Teck Coal Limited



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #1)	E450 Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision/Reaction Cell ICPMS. Note: For Extraction #1, the extraction solution is 1M Magnesium Chloride and is intended to extract the "Exchangeable and Adsorbed" metals.
Metals by CRC ICPMS (Tessier Extraction #2)	E450A Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by collision cell ICPMS. Note: For Extraction #2, the extraction solution is 1M Sodium Acetate adjusted to pH 5 and is intended to extract the "Carbonate" metals.
Metals by CRC ICPMS (Tessier Extraction #3)	E450B Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS.Note: For Extraction #3, the extraction solution is 0.1 M Hydroxylamine Hydro- Chloride in 25% v/v Acetic Acid and is intended to extract the □Easily Reducible Metals and Iron Oxides□.

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Client : Teck Coal Limited



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #4)	E450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the □Organic Bound□ metals.
Metals by CRC ICPMS (Tessier Extraction RM)	E450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
Mercury in Soil/Solid by CVAAS	E510 Calgary - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.
PAHs by Hex:Ace GC-MS	E641A Calgary - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.
Particle Size Analysis (Pipette) - Wentworth Classification	EC184A Saskatoon - Environmental	Soil/Solid	Modified Wentworth	The particle size determination is performed by various methods to generate a Grain Size curve. The data from the curve is then used to produce particle size ranges based on the Modified Wentworth Classification system.
Total Organic Carbon (Calculated) in soil	EC356 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Calgary - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.

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Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 Calgary - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCI. This method is intended to liberate metals that may be environmentally available.
Extraction of Metals for CRC ICPMS (Tessier - EA)	EP450 Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision/Reaction Cell ICPMS. Note: For Extraction #1, the extraction solution is 1M Magnesium Chloride and is intended to extract the "Exchangeable and Adsorbed" metals.
Extraction of Metals for CRC ICPMS (Tessier - CM)	EP450A Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by collision cell ICPMS. Note: For Extraction #2, the extraction solution is 1M Sodium Acetate adjusted to pH 5 and is intended to extract the "Carbonate" metals.
Extraction of Metals for CRC ICPMS (Tessier-FEO)	EP450B Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS.Note: For Extraction #3, the extraction solution is 0.1 M Hydroxylamine Hydro- Chloride in 25% v/v Acetic Acid and is intended to extract the □Easily Reducible Metals and Iron Oxides□.

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Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Extraction of Metals for CRC ICPMS (Tessier - OB)	EP450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the \square Organic Bound \square metals.
Extraction of Metals for CRC ICPMS (Tessier - RM)	EP450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Calgary - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind in Soil/Solid <60°C	EPP442 Calgary - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.



QUALITY CONTROL REPORT

Work Order : CG2212702

Contact : Teck Coal Limited
Contact : Giovanna Diaz
Address : 421 Pine Avenue

:421 Pine Avenue

Sparwood BC Canada V0B2G0

Telephone : ---

Project : REGIONAL EFFECTS PROGRAM

PO : VPO00816101

C-O-C number : REP_LAEMP_GC_2022-09_ALS

Sampler : JI Site : ---

Quote number : Teck Coal Master Quote

No. of samples received : 10
No. of samples analysed : 10

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Laboratory : Calgary - Environmental

Account Manager : Lyudmyla Shvets

Address : 2559 29th Street NE

Calgary, Alberta Canada T1Y 7B5

Telephone :+1 403 407 1800

Date Samples Received : 15-Sep-2022 08:50

Date Analysis Commenced : 19-Sep-2022

Issue Date : 17-Oct-2022 14:40

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

This Quality Control Report contains the following information:

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	Position	Laboratory Department	
Amber Sheikh	Laboratory Assistant	Calgary Organics, Calgary, Alberta	
Dwayne Bennett	Technical Specialist	Calgary Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Saskatoon Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Saskatoon Sask Soils, Saskatoon, Saskatchewan	
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Sorina Motea	Laboratory Analyst	Calgary Organics, Calgary, Alberta	

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 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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 : CG2212702

 Client
 : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier	
Physical Tests (QC	C Lot: 653383)											
CG2212702-001	RG_GHBP_SE-1_2022-09- 12_N	moisture		E144	0.25	%	40.5	40.8	0.902%	20%		
Physical Tests (QC	C Lot: 655392)											
CG2212702-001	RG_GHBP_SE-1_2022-09- 12_N	pH (1:2 soil:water)		E108	0.10	pH units	8.40	8.35	0.597%	5%		
Organic / Inorganic	Carbon (QC Lot: 65865	3)										
CG2212684-004	Anonymous	carbon, total [TC]		E351	0.050	%	11.4	11.9	4.60%	20%		
Organic / Inorganic	Carbon (QC Lot: 65865	5)										
CG2212740-001	Anonymous	carbon, total [TC]		E351	0.050	%	4.94	4.69	5.13%	20%		
Organic / Inorganic	Carbon (QC Lot: 65964	0)										
CG2212675-001	Anonymous	carbon, inorganic [IC]		E354	0.050	%	0.170	0.172	0.002	Diff <2x LOR		
Organic / Inorganic	Carbon (QC Lot: 65964	8)										
CG2212684-008	Anonymous	carbon, inorganic [IC]		E354	0.050	%	6.03	5.83	3.37%	20%		
Organic / Inorganic	Carbon (QC Lot: 65991	6)										
CG2212683-011	Anonymous	carbon, inorganic [IC]		E354	0.050	%	2.91	2.89	0.697%	20%		
Metals (QC Lot: 65	5189)											
CG2212702-001	RG_GHBP_SE-1_2022-09- 12_N	mercury	7439-97-6	E510	0.0050	mg/kg	0.0408	0.0393	3.80%	40%		
Metals (QC Lot: 65	5190)											
CG2212702-001	RG_GHBP_SE-1_2022-09-	aluminum	7429-90-5	E440	50	mg/kg	9390	7910	17.2%	40%		
	12_N	antimony	7440-36-0	E440	0.10	mg/kg	0.83	0.82	1.09%	30%		
		arsenic	7440-38-2	E440	0.10	mg/kg	6.95	7.09	1.98%	30%		
		barium	7440-39-3	E440	0.50	mg/kg	196	172	12.8%	40%		
		beryllium	7440-41-7	E440	0.10	mg/kg	0.79	0.77	3.12%	30%		
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR		
		boron	7440-42-8	E440	5.0	mg/kg	10.0	7.1	2.8	Diff <2x LOR		
		cadmium	7440-43-9	E440	0.020	mg/kg	1.01	1.00	0.785%	30%		
		calcium	7440-70-2	E440	50	mg/kg	41500	39400	5.35%	30%		
		chromium	7440-47-3	E440	0.50	mg/kg	14.1	12.6	11.2%	30%		
		cobalt	7440-48-4	E440	0.10	mg/kg	8.55	8.55	0.0451%	30%		
		copper	7440-50-8	E440	0.50	mg/kg	17.0	17.9	5.36%	30%		
		iron	7439-89-6	E440	50	mg/kg	20400	19700	3.69%	30%		
		lead	7439-92-1	E440	0.50	mg/kg	13.2	13.5	2.29%	40%		

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ALS

Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Metals (QC Lot: 655	5190) - continued										
CG2212702-001	RG_GHBP_SE-1_2022-09- 12 N	lithium	7439-93-2	E440	2.0	mg/kg	13.9	12.6	1.3	Diff <2x LOR	
		magnesium	7439-95-4	E440	20	mg/kg	6020	5890	2.24%	30%	
		manganese	7439-96-5	E440	1.0	mg/kg	520	517	0.562%	30%	
		molybdenum	7439-98-7	E440	0.10	mg/kg	1.66	1.62	2.08%	40%	
		nickel	7440-02-0	E440	0.50	mg/kg	63.5	63.1	0.660%	30%	
		phosphorus	7723-14-0	E440	50	mg/kg	1290	1220	6.02%	30%	
		potassium	7440-09-7	E440	100	mg/kg	2050	1660	21.0%	40%	
		selenium	7782-49-2	E440	0.20	mg/kg	6.85	7.15	4.32%	30%	
		silver	7440-22-4	E440	0.10	mg/kg	0.20	0.22	0.02	Diff <2x LOR	
		sodium	7440-23-5	E440	50	mg/kg	76	67	9	Diff <2x LOR	
		strontium	7440-24-6	E440	0.50	mg/kg	49.4	48.8	1.10%	40%	
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	
		thallium	7440-28-0	E440	0.050	mg/kg	0.237	0.229	0.008	Diff <2x LOR	
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium	7440-32-6	E440	1.0	mg/kg	15.8	13.2	17.6%	40%	
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		uranium	7440-61-1	E440	0.050	mg/kg	1.04	1.06	1.29%	30%	
		vanadium	7440-62-2	E440	0.20	mg/kg	30.4	27.1	11.5%	30%	
		zinc	7440-66-6	E440	2.0	mg/kg	132	134	1.81%	30%	
		zirconium	7440-67-7	E440	1.0	mg/kg	1.2	1.3	0.1	Diff <2x LOR	
Polycyclic Aromatic	Hydrocarbons (QC Lot	: 653382)									
CG2212702-001	RG_GHBP_SE-1_2022-09- 12_N	acenaphthene	83-32-9	E641A	0.050	mg/kg	0.067	0.063	0.004	Diff <2x LOR	
		acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		acridine	260-94-6	E641A	0.050	mg/kg	0.094	0.124	0.030	Diff <2x LOR	
		anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.076	0.085	0.009	Diff <2x LOR	
		benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		chrysene	218-01-9	E641A	0.050	mg/kg	0.208	0.215	3.28%	50%	
		dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		fluorene	86-73-7	E641A	0.050	mg/kg	0.144	0.187	0.043	Diff <2x LOR	
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	

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Client : Teck Coal Limited



sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
olycyclic Aromatic	Hydrocarbons (QC Lot	:: 653382) - continued									
CG2212702-001	RG_GHBP_SE-1_2022-09- 12_N	methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	0.847	0.780	8.21%	50%	
		methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	1.45	1.36	6.65%	50%	
		naphthalene	91-20-3	E641A	0.015	mg/kg	0.426	0.391	8.47%	50%	
		phenanthrene	85-01-8	E641A	0.050	mg/kg	0.650	0.860	27.8%	50%	
		pyrene	129-00-0	E641A	0.050	mg/kg	0.064	0.063	0.0008	Diff <2x LOR	
		quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
xchangeable & Ad	sorbed Metals (QC Lot:	686843)									
G2212702-007	RG_GANF_SE-2_2022-09-	aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
	13_N	antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450	0.50	mg/kg	25.9	26.6	2.98%	30%	
		beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.102	0.109	0.006	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450	50	mg/kg	3620	3950	8.68%	30%	
		chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.27	0.27	0.002	Diff <2x LOR	
		copper, leachable	7440-50-8	E450	0.50	mg/kg	1.05	1.18	0.13	Diff <2x LOR	
		iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450	1.0	mg/kg	94.9	102	7.30%	30%	
		molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450	0.50	mg/kg	0.53	0.58	0.05	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		potassium, leachable	7440-09-7	E450	100	mg/kg	150	120	30	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450	0.50	mg/kg	7.85	8.18	4.06%	30%	
		thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	

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aboratory sample ID							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
	Isorbed Metals (QC Lot:	· · · · · · · · · · · · · · · · · · ·									
CG2212702-007	RG_GANF_SE-2_2022-09- 13 N	zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
Carbonate Metals (QC Lot: 687058)										
CG2212702-007	RG_GANF_SE-2_2022-09- 13 N	aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
	\ \frac{1}{2}	antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.066	0.067	0.0006	Diff <2x LOR	
		barium, leachable	7440-39-3	E450A	2.0	mg/kg	52.3	51.6	1.27%	30%	
		beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.231	0.246	0.014	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450A	50	mg/kg	43600	43100	1.31%	30%	
		chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	0.75	0.78	3.80%	30%	
		copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450A	5.0	mg/kg	116	121	4.29%	30%	
		molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450A	2.0	mg/kg	2.0	2.0	0.02	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450A	5.0	mg/kg	24.8	24.6	0.2	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.158	0.148	0.010	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		zinc, leachable	7440-66-6	E450A	1.0	mg/kg	5.3	5.3	0.003	Diff <2x LOR	
asily Roducible M	etals and Iron Oxides(Q	·				3 3					
G2212702-007	RG_GANF_SE-2_2022-09-	aluminum, leachable	7429-90-5	E450B	50	mg/kg	490	466	5.04%	30%	
	13_N	antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.450	0.460	2.13%	30%	
		barium, leachable	7440-39-3	E450B	0.50	mg/kg	32.0	40.1	22.2%	30%	

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ub-Matrix: Soil/Solid							Labora	ntory Duplicate (D	UP) Report		
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
	etals and Iron Oxides (Q	C Lot: 690795) - continued									
G2212702-007	RG_GANF_SE-2_2022-09- 13_N	beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.28	0.32	0.04	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.335	0.378	12.0%	30%	
		calcium, leachable	7440-70-2	E450B	50	mg/kg	10300	16600	46.9%	30%	DUP-
		chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.74	0.79	0.06	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	3.28	3.51	6.49%	30%	
		copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.52	0.53	0.004	Diff <2x LOR	
		iron, leachable	7439-89-6	E450B	50	mg/kg	3220	3220	0.246%	30%	
		lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.30	3.64	9.87%	30%	
		lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450B	1.0	mg/kg	146	171	16.0%	30%	
		molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450B	0.50	mg/kg	9.36	9.69	3.39%	30%	
		phosphorus, leachable	7723-14-0	E450B	50	mg/kg	132	86	46	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450B	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450B	0.50	mg/kg	8.12	11.4	33.4%	30%	DUP-
		thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.152	0.180	0.028	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.36	2.31	2.17%	30%	
		zinc, leachable	7440-66-6	E450B	1.0	mg/kg	25.8	26.3	1.94%	30%	
rganic Bound Met	als (QC Lot: 693060)										
G2212702-007	RG_GANF_SE-2_2022-09- 13_N	aluminum, leachable	7429-90-5	E450C	50	mg/kg	1630	1650	1.57%	30%	
	10_1	antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.446	0.490	9.37%	30%	
		barium, leachable	7440-39-3	E450C	0.50	mg/kg	23.4	24.3	3.77%	30%	
		beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.067	0.074	0.006	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450C	50	mg/kg	1410	1740	21.2%	30%	
		chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.30	3.30	0.004	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	0.92	1.04	12.8%	30%	
		copper, leachable	7440-50-8	E450C	0.50	mg/kg	6.69	7.27	8.28%	30%	

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Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Organic Bound Met	als (QC Lot: 693060) - c	ontinued									
CG2212702-007	RG_GANF_SE-2_2022-09- 13_N	iron, leachable	7439-89-6	E450C	50	mg/kg	2030	2190	7.76%	30%	
		lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.88	0.93	0.05	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450C	1.0	mg/kg	13.6	13.4	1.51%	30%	
		molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450C	0.50	mg/kg	5.73	6.24	8.47%	30%	
		selenium, leachable	7782-49-2	E450C	0.20	mg/kg	1.19	1.25	0.06	Diff <2x LOR	
		silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.67	5.13	9.37%	30%	
		thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450C	1.0	mg/kg	17.4	17.9	3.30%	30%	
		uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.233	0.235	0.002	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.38	4.44	1.15%	30%	
		zinc, leachable	7440-66-6	E450C	1.0	mg/kg	7.3	7.8	6.27%	30%	
Residual Metals (Q	C Lot: 695138)										
CG2212702-007	RG_GANF_SE-2_2022-09- 13_N	aluminum, leachable	7429-90-5	E450D	50	mg/kg	6910	6150	11.6%	30%	
		antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.62	0.60	0.03	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	<5.00	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450D	2.0	mg/kg	106	104	1.94%	30%	
		beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.33	0.31	0.02	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.073	0.074	0.001	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450D	50	mg/kg	454	456	0.362%	30%	
		chromium, leachable	7440-47-3	E450D	5.0	mg/kg	9.7	8.7	1.0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.54	2.34	8.09%	30%	
		copper, leachable	7440-50-8	E450D	0.50	mg/kg	11.1	10.7	4.19%	30%	
		iron, leachable	7439-89-6	E450D	50	mg/kg	8960	8630	3.73%	30%	
		lead, leachable	7439-92-1	E450D	0.50	mg/kg	5.71	5.51	3.67%	30%	
		lithium, leachable	7439-93-2	E450D	5.0	mg/kg	6.2	5.6	0.6	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450D	5.0	mg/kg	35.0	34.0	2.88%	30%	
		molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.90	0.74	0.17	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450D	2.0	mg/kg	9.6	8.8	0.8	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.54	0.39	0.15	Diff <2x LOR	
ı		silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.13	0.17	0.04	Diff <2x LOR	

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Sub-Matrix: Soil/Solid							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Residual Metals (QC Lot: 695138) - continued											
CG2212702-007	RG_GANF_SE-2_2022-09- 13_N	strontium, leachable	7440-24-6	E450D	5.0	mg/kg	19.2	18.1	1.0	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.128	0.120	0.008	Diff <2x LOR	
		tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450D	5.0	mg/kg	16.8	14.2	2.6	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.254	0.242	0.012	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	23.6	21.0	11.4%	30%	
		zinc, leachable	7440-66-6	E450D	1.0	mg/kg	52.1	49.7	4.60%	30%	

Qualifiers

Qualifier Description

DUP-H Duplicate results outside ALS DQO, due to sample heterogeneity.

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Method Blank (MB) Report

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

Analyte	CAS Number Me	ethod	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 653383)						
moisture	E1 ₁	44	0.25	%	<0.25	
Organic / Inorganic Carbon (QCLot:						
carbon, total [TC]	E3	51	0.05	%	<0.050	
Organic / Inorganic Carbon (QCLot:						
carbon, total [TC]	E3	51	0.05	%	<0.050	
Organic / Inorganic Carbon (QCLot:						
carbon, inorganic [IC]	E3	54	0.05	%	<0.050	
Organic / Inorganic Carbon (QCLot:						
carbon, inorganic [IC]	E3	54	0.05	%	<0.050	
Organic / Inorganic Carbon (QCLot:		54	0.05	0/	.0.252	I
carbon, inorganic [IC]	E3:	54	0.05	%	<0.050	
Metals (QCLot: 655189)	7400 07 0 55	40	0.005		10,0050	I
mercury	7439-97-6 E5	10	0.005	mg/kg	<0.0050	
Metals (QCLot: 655190)	7400 00 5 54	40	50		450	I
aluminum 	7429-90-5 E4		50	mg/kg	<50	
antimony	7440-36-0 E4- 7440-38-2 E4-		0.1	mg/kg	<0.10 <0.10	
arsenic	7440-38-2 E44 7440-39-3 E44		0.1	mg/kg	<0.10	
barium	7440-41-7		0.5	mg/kg	<0.50	
beryllium	7440-69-9 E4		0.1	mg/kg	<0.10	
bismuth	7440-42-8 E4		5	mg/kg	<5.0	
boron	7440-43-9 E4		0.02	mg/kg	<0.020	
cadmium	7440-70-2 E4		50	mg/kg mg/kg	<50	
calcium	7440-47-3 E4		0.5	mg/kg	<0.50	
cobalt	7440-48-4 E4		0.1	mg/kg	<0.10	
copper	7440-50-8 E4		0.5	mg/kg	<0.50	
iron	7439-89-6 E4		50	mg/kg	<50	
lead	7439-92-1 E4		0.5	mg/kg	<0.50	
lithium	7439-93-2 E4		2	mg/kg	<2.0	
magnesium	7439-95-4 E4		20	mg/kg	<20	
manganese	7439-96-5 E4		1	mg/kg	<1.0	
molybdenum	7439-98-7 E4		0.1	mg/kg	<0.10	
nickel	7440-02-0 E4		0.5	mg/kg	<0.50	
liordi	7440-02-0		0.5	marka	-0.00	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 655190) - continu	ued					
phosphorus	7723-14-0	E440	50	mg/kg	<50	
ootassium	7440-09-7	E440	100	mg/kg	<100	
elenium	7782-49-2	E440	0.2	mg/kg	<0.20	
silver	7440-22-4	E440	0.1	mg/kg	<0.10	
odium	7440-23-5	E440	50	mg/kg	<50	
trontium	7440-24-6	E440	0.5	mg/kg	<0.50	
ulfur	7704-34-9	E440	1000	mg/kg	<1000	
hallium	7440-28-0	E440	0.05	mg/kg	<0.050	
in	7440-31-5	E440	2	mg/kg	<2.0	
itanium	7440-32-6	E440	1	mg/kg	<1.0	
ungsten	7440-33-7	E440	0.5	mg/kg	<0.50	
ıranium	7440-61-1	E440	0.05	mg/kg	<0.050	
ranadium	7440-62-2	E440	0.2	mg/kg	<0.20	
tinc	7440-66-6	E440	2	mg/kg	<2.0	
tirconium	7440-67-7	E440	1	mg/kg	<1.0	
Polycyclic Aromatic Hydrocarbor	ns (QCLot: 653382)					
cenaphthene	83-32-9	E641A	0.05	mg/kg	<0.050	
cenaphthylene	208-96-8	E641A	0.05	mg/kg	<0.050	
ocridine	260-94-6	E641A	0.05	mg/kg	<0.050	
anthracene	120-12-7	E641A	0.05	mg/kg	<0.050	
enz(a)anthracene	56-55-3	E641A	0.05	mg/kg	<0.050	
penzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	<0.050	
penzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	<0.050	
penzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	<0.050	
penzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	<0.050	
chrysene	218-01-9	E641A	0.05	mg/kg	<0.050	
libenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	<0.050	
uoranthene	206-44-0	E641A	0.05	mg/kg	<0.050	
uorene	86-73-7	E641A	0.05	mg/kg	<0.050	
ndeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	<0.050	
nethylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	<0.030	
nethylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	<0.030	
naphthalene	91-20-3	E641A	0.01	mg/kg	<0.018	
henanthrene	85-01-8	E641A	0.05	mg/kg	<0.050	
pyrene	129-00-0	E641A	0.05	mg/kg	<0.050	
quinoline	91-22-5	E641A	0.05	mg/kg	<0.050	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
Exchangeable & Adsorbed Metals					
luminum, leachable	7429-90-5 E450	50	mg/kg	<50	
ntimony, leachable	7440-36-0 E450	0.1	mg/kg	<0.10	
rsenic, leachable	7440-38-2 E450	0.05	mg/kg	<0.050	
arium, leachable	7440-39-3 E450	0.5	mg/kg	<0.50	
eryllium, leachable	7440-41-7 E450	0.2	mg/kg	<0.20	
ismuth, leachable	7440-69-9 E450	0.2	mg/kg	<0.20	
admium, leachable	7440-43-9 E450	0.05	mg/kg	<0.050	
alcium, leachable	7440-70-2 E450	50	mg/kg	<50	
hromium, leachable	7440-47-3 E450	0.5	mg/kg	<0.50	
obalt, leachable	7440-48-4 E450	0.1	mg/kg	<0.10	
opper, leachable	7440-50-8 E450	0.5	mg/kg	<0.50	
on, leachable	7439-89-6 E450	50	mg/kg	<50	
ead, leachable	7439-92-1 E450	0.5	mg/kg	<0.50	
hium, leachable	7439-93-2 E450	5	mg/kg	<5.0	
nanganese, leachable	7439-96-5 E450	1	mg/kg	<1.0	
olybdenum, leachable	7439-98-7 E450	0.5	mg/kg	<0.50	
ckel, leachable	7440-02-0 E450	0.5	mg/kg	<0.50	
hosphorus, leachable	7723-14-0 E450	50	mg/kg	<50	
otassium, leachable	7440-09-7 E450	100	mg/kg	<100	
elenium, leachable	7782-49-2 E450	0.2	mg/kg	<0.20	
ilver, leachable	7440-22-4 E450	0.1	mg/kg	<0.10	
odium, leachable	7440-23-5 E450	100	mg/kg	<100	
trontium, leachable	7440-24-6 E450	0.5	mg/kg	<0.50	
nallium, leachable	7440-28-0 E450	0.05	mg/kg	<0.050	
n, leachable	7440-31-5 E450	2	mg/kg	<2.0	
tanium, leachable	7440-32-6 E450	1	mg/kg	<1.0	
ranium, leachable	7440-61-1 E450	0.05	mg/kg	<0.050	
anadium, leachable	7440-62-2 E450	0.2	mg/kg	<0.20	
inc, leachable	7440-66-6 E450	1	mg/kg	<1.0	
Carbonate Metals (QCLot: 687058)					
uminum, leachable	7429-90-5 E450A	50	mg/kg	<50	
ntimony, leachable	7440-36-0 E450A	0.1	mg/kg	<0.10	
rsenic, leachable	7440-38-2 E450A	0.05	mg/kg	<0.050	
arium, leachable	7440-39-3 E450A	2	mg/kg	<2.0	
eryllium, leachable	7440-41-7 E450A	0.2	mg/kg	<0.20	
oismuth, leachable	7440-69-9 E450A	0.2	mg/kg	<0.20	

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nalyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Carbonate Metals (QCLot: 687058)	- continued					
admium, leachable	7440-43-9	E450A	0.05	mg/kg	<0.050	
alcium, leachable	7440-70-2	E450A	50	mg/kg	<50	
hromium, leachable	7440-47-3	E450A	5	mg/kg	<5.0	
obalt, leachable	7440-48-4	E450A	0.1	mg/kg	<0.10	
opper, leachable	7440-50-8	E450A	0.5	mg/kg	<0.50	
on, leachable	7439-89-6	E450A	50	mg/kg	<50	
ead, leachable	7439-92-1	E450A	0.5	mg/kg	<0.50	
hium, leachable	7439-93-2	E450A	5	mg/kg	<5.0	
nanganese, leachable	7439-96-5	E450A	5	mg/kg	<5.0	
olybdenum, leachable	7439-98-7	E450A	0.5	mg/kg	<0.50	
ickel, leachable	7440-02-0	E450A	2	mg/kg	<2.0	
hosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	
elenium, leachable	7782-49-2	E450A	0.2	mg/kg	<0.20	
lver, leachable	7440-22-4	E450A	0.1	mg/kg	<0.10	
trontium, leachable	7440-24-6	E450A	5	mg/kg	<5.0	
nallium, leachable	7440-28-0	E450A	0.05	mg/kg	<0.050	
n, leachable	7440-31-5	E450A	2	mg/kg	<2.0	
tanium, leachable	7440-32-6	E450A	5	mg/kg	<5.0	
ranium, leachable	7440-61-1	E450A	0.05	mg/kg	<0.050	
anadium, leachable	7440-62-2	E450A	0.2	mg/kg	<0.20	
nc, leachable	7440-66-6	E450A	1	mg/kg	<1.0	
asily Reducible Metals and Iron O	xides (QCI of: 690795)					
luminum, leachable	7429-90-5	E450B	50	mg/kg	<50	
ntimony, leachable	7440-36-0	E450B	0.1	mg/kg	<0.10	
rsenic, leachable	7440-38-2	E450B	0.05	mg/kg	<0.050	
arium, leachable	7440-39-3	E450B	0.5	mg/kg	<0.50	
eryllium, leachable	7440-41-7	E450B	0.2	mg/kg	<0.20	
ismuth, leachable	7440-69-9	E450B	0.2	mg/kg	<0.20	
admium, leachable	7440-43-9		0.05	mg/kg	<0.050	
alcium, leachable	7440-70-2		50	mg/kg	<50	
hromium, leachable	7440-47-3		0.5	mg/kg	<0.50	
obalt, leachable	7440-48-4		0.1	mg/kg	<0.10	
opper, leachable	7440-50-8		0.5	mg/kg	<0.50	
on, leachable	7439-89-6		50	mg/kg	<50	
ead, leachable	7439-92-1		0.5	mg/kg	<0.50	
au, icaciiabic	7439-93-2		5	mg/kg	<5.0	

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Sub-Matrix: Soil/Solid	2424	88-411	105			0 ""
Analyte	CAS Number		LOR	Unit	Result	Qualifier
Easily Reducible Metals and Iron	Oxides (QCLot: 690795) - 6 7439-96-5		1	malka	<1.0	
manganese, leachable				mg/kg		
nolybdenum, leachable	7439-98-7		0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0		0.5	mg/kg	<0.50	
phosphorus, leachable	7723-14-0		50	mg/kg	<50	
selenium, leachable	7782-49-2		0.2	mg/kg	<0.20	
silver, leachable	7440-22-4		0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6		0.5	mg/kg	<0.50	
hallium, leachable	7440-28-0	E450B	0.05	mg/kg	<0.050	
in, leachable	7440-31-5	E450B	2	mg/kg	<2.0	
itanium, leachable	7440-32-6	E450B	1	mg/kg	<1.0	
ıranium, leachable	7440-61-1	E450B	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450B	0.2	mg/kg	<0.20	
tinc, leachable	7440-66-6	E450B	1	mg/kg	<1.0	
Organic Bound Metals (QCLot: 6	93060)					
lluminum, leachable	7429-90-5	E450C	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450C	0.1	mg/kg	<0.10	
rsenic, leachable	7440-38-2	E450C	0.05	mg/kg	<0.050	
parium, leachable	7440-39-3	E450C	0.5	mg/kg	<0.50	
peryllium, leachable	7440-41-7	E450C	0.2	mg/kg	<0.20	
oismuth, leachable	7440-69-9	E450C	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450C	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450C	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450C	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4	E450C	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450C	0.5	mg/kg	<0.50	
ron, leachable	7439-89-6	E450C	50	mg/kg	<50	
ead, leachable	7439-92-1	E450C	0.5	mg/kg	<0.50	
thium, leachable	7439-93-2		5	mg/kg	<5.0	
nanganese, leachable	7439-96-5		1	mg/kg	<1.0	
nolybdenum, leachable	7439-98-7		0.5	mg/kg	<0.50	
ickel, leachable	7440-02-0		0.5	mg/kg	<0.50	
elenium, leachable	7782-49-2		0.2	mg/kg	<0.20	
ilver, leachable	7440-22-4		0.1	mg/kg	<0.10	
	7440-22-4		0.5	mg/kg	<0.50	
strontium, leachable	7440-28-0		0.05		<0.050	
hallium, leachable				mg/kg		
in, leachable	7440-31-5	E450C	2	mg/kg	<2.0	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Organic Bound Metals (QCLot:	693060) - continued					
titanium, leachable	7440-32-6	E450C	1	mg/kg	<1.0	
uranium, leachable	7440-61-1	E450C	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450C	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450C	1	mg/kg	<1.0	
Residual Metals (QCLot: 695138	3)					
aluminum, leachable	7429-90-5	E450D	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450D	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450D	0.5	mg/kg	<0.50	
parium, leachable	7440-39-3	E450D	2	mg/kg	<2.0	
beryllium, leachable	7440-41-7	E450D	0.2	mg/kg	<0.20	
pismuth, leachable	7440-69-9	E450D	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450D	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450D	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450D	5	mg/kg	<5.0	
obalt, leachable	7440-48-4	E450D	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450D	0.5	mg/kg	<0.50	
ron, leachable	7439-89-6	E450D	50	mg/kg	<50	
ead, leachable	7439-92-1	E450D	0.5	mg/kg	<0.50	
ithium, leachable	7439-93-2	E450D	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450D	5	mg/kg	<5.0	
molybdenum, leachable	7439-98-7	E450D	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450D	2	mg/kg	<2.0	
selenium, leachable	7782-49-2	E450D	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450D	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450D	5	mg/kg	<5.0	
hallium, leachable	7440-28-0	E450D	0.05	mg/kg	<0.050	
in, leachable	7440-31-5	E450D	2	mg/kg	<2.0	
itanium, leachable	7440-32-6	E450D	5	mg/kg	<5.0	
ıranium, leachable	7440-61-1	E450D	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450D	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450D	1	mg/kg	<1.0	

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Soil/Solid					Laboratory Co	ntrol Sample (LCS)	Report	
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte CAS Numb	er Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 653383)								
moisture -	E144	0.25	%	50 %	99.5	90.0	110	
Physical Tests (QCLot: 655392)								
pH (1:2 soil:water)	E108		pH units	7 pH units	99.4	97.0	103	
Organic / Inorganic Carbon (QCLot: 658653)								
carbon, total [TC]	E351	0.05	%	48 %	102	90.0	110	
Organic / Inorganic Carbon (QCLot: 658655)								
	E351	0.05	%	48 %	100	90.0	110	
Organic / Inorganic Carbon (QCLot: 659640)								
	E354	0.05	%	0.5 %	94.5	90.0	110	
Organic / Inorganic Carbon (QCLot: 659648)								
	E354	0.05	%	0.5 %	94.8	90.0	110	
Organic / Inorganic Carbon (QCLot: 659916)								
	E354	0.05	%	0.5 %	93.0	90.0	110	
Metals (QCLot: 655189)								
mercury 7439-97	-6 E510	0.005	mg/kg	0.1 mg/kg	95.0	80.0	120	
Metals (QCLot: 655190)								
aluminum 7429-90	-5 E440	50	mg/kg	200 mg/kg	98.8	80.0	120	
antimony 7440-36	-0 E440	0.1	mg/kg	100 mg/kg	100	80.0	120	
arsenic 7440-38	-2 E440	0.1	mg/kg	100 mg/kg	89.6	80.0	120	
barium 7440-39	-3 E440	0.5	mg/kg	25 mg/kg	92.6	80.0	120	
beryllium 7440-41	-7 E440	0.1	mg/kg	10 mg/kg	90.9	80.0	120	
bismuth 7440-69	-9 E440	0.2	mg/kg	100 mg/kg	91.7	80.0	120	
boron 7440-42	-8 E440	5	mg/kg	100 mg/kg	91.7	80.0	120	
cadmium 7440-43	-9 E440	0.02	mg/kg	10 mg/kg	90.5	80.0	120	
calcium 7440-70	-2 E440	50	mg/kg	5000 mg/kg	112	80.0	120	
chromium 7440-47	-3 E440	0.5	mg/kg	25 mg/kg	88.3	80.0	120	
cobalt 7440-48	-4 E440	0.1	mg/kg	25 mg/kg	87.5	80.0	120	
copper 7440-50	-8 E440	0.5	mg/kg	25 mg/kg	87.6	80.0	120	
iron 7439-89	-6 E440	50	mg/kg	100 mg/kg	112	80.0	120	
lead 7439-92	-1 E440	0.5	mg/kg	50 mg/kg	93.0	80.0	120	
lithium 7439-93	-2 E440	2	mg/kg	25 mg/kg	89.1	80.0	120	
magnesium 7439-95	-4 E440	20	mg/kg	5000 mg/kg	88.6	80.0	120	

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Sub-Matrix: Soil/Solid				Laboratory Control Sample (LCS) Report						
					Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Metals (QCLot: 655190) - continued										
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	90.9	80.0	120		
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	94.8	80.0	120		
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	87.7	80.0	120		
phosphorus	7723-14-0	E440	50	50 mg/kg		97.1	80.0	120		
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	91.1	80.0	120		
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	91.7	80.0	120		
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	87.0	80.0	120		
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	90.2	80.0	120		
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	96.9	80.0	120		
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	94.3	80.0	120		
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	95.3	80.0	120		
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	93.7	80.0	120		
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	99.6	80.0	120		
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	87.8	80.0	120		
uranium	7440-61-1	0.05	mg/kg	0.5 mg/kg	91.9	80.0	120			
vanadium	7440-62-2	7440-62-2 E440		mg/kg	50 mg/kg	90.9	80.0	120		
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	96.4	80.0	120		
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	98.0	80.0	120		
Polycyclic Aromatic Hydrocarbons (QC	Lot: 653382)								'	
acenaphthene	83-32-9	E641A	0.05	mg/kg	0.5 mg/kg	101	60.0	130		
acenaphthylene	208-96-8	E641A	0.05	mg/kg	0.5 mg/kg	92.6	60.0	130		
acridine	260-94-6	E641A	0.05	mg/kg	0.5 mg/kg	90.7	60.0	130		
anthracene	120-12-7	E641A	0.05	mg/kg	0.5 mg/kg	87.4	60.0	130		
benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	0.5 mg/kg	90.2	60.0	130		
benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	0.5 mg/kg	65.6	60.0	130		
benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	0.5 mg/kg	97.0	60.0	130		
benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	0.5 mg/kg	90.4	60.0	130		
benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	0.5 mg/kg	88.1	60.0	130		
chrysene	218-01-9	E641A	0.05	mg/kg	0.5 mg/kg	89.7	60.0	130		
dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	0.5 mg/kg	93.4	60.0	130		
fluoranthene	206-44-0	E641A	0.05	mg/kg	0.5 mg/kg	98.5	60.0	130		
fluorene	86-73-7	E641A	0.05	mg/kg	0.5 mg/kg	97.4	60.0	130		
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	0.5 mg/kg	87.3	60.0	130		
methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	0.5 mg/kg	104	60.0	130		
methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	0.5 mg/kg	101	60.0	130		
naphthalene	91-20-3	E641A	0.01	mg/kg	0.5 mg/kg	104	50.0	130		
phenanthrene	85-01-8	E641A	0.05	mg/kg	0.5 mg/kg	97.8	60.0	130		

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Sub-Matrix: Soil/Solid			Laboratory Control Sample (LCS) Report							
				Spike Recovery (%) Recovery Limits (%)						
Analyte	CAS Number Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Polycyclic Aromatic Hydrocarbons (QCLc	ot: 653382) - continued									
pyrene	129-00-0 E641A	0.05	mg/kg	0.5 mg/kg	95.8	60.0	130			
quinoline	91-22-5 E641A	0.05	mg/kg	0.5 mg/kg	93.0	60.0	130			
Exchangeable & Adsorbed Metals (QCLot	: 686843)									
aluminum, leachable	7429-90-5 E450	50	mg/kg	2 mg/kg	98.8	70.0	130			
antimony, leachable	7440-36-0 E450	0.1	mg/kg	0.2 mg/kg	106	70.0	130			
arsenic, leachable	7440-38-2 E450	0.05	mg/kg	0.2 mg/kg	99.8	70.0	130			
barium, leachable	7440-39-3 E450	0.5	mg/kg	0.2 mg/kg	99.1	70.0	130			
beryllium, leachable	7440-41-7 E450	0.2	mg/kg	0.4 mg/kg	109	70.0	130			
bismuth, leachable	7440-69-9 E450	0.2	mg/kg	0.1 mg/kg	90.3	70.0	130			
cadmium, leachable	7440-43-9 E450	0.05	mg/kg	0.04 mg/kg	102	70.0	130			
calcium, leachable	7440-70-2 E450	50	mg/kg	40 mg/kg	104	70.0	130			
chromium, leachable	7440-47-3 E450	0.5	mg/kg	0.4 mg/kg	99.8	70.0	130			
cobalt, leachable	7440-48-4 E450	0.1	mg/kg	0.2 mg/kg	96.6	70.0	130			
copper, leachable	7440-50-8 E450	0.5	mg/kg	0.2 mg/kg	98.6	70.0	130			
iron, leachable	7439-89-6 E450	50	mg/kg	20 mg/kg	102	70.0	130			
lead, leachable	7439-92-1 E450	0.5	mg/kg	0.2 mg/kg	98.9	70.0	130			
lithium, leachable	7439-93-2 E450	5	mg/kg	1 mg/kg	106	70.0	130			
manganese, leachable	7439-96-5 E450	1	mg/kg	0.2 mg/kg	97.2	70.0	130			
molybdenum, leachable	7439-98-7 E450	0.5	mg/kg	0.2 mg/kg	104	70.0	130			
nickel, leachable	7440-02-0 E450	0.5	mg/kg	0.4 mg/kg	95.8	70.0	130			
phosphorus, leachable	7723-14-0 E450	50	mg/kg	100 mg/kg	106	70.0	130			
potassium, leachable	7440-09-7 E450	100	mg/kg	40 mg/kg	92.3	70.0	130			
selenium, leachable	7782-49-2 E450	0.2	mg/kg	0.4 mg/kg	106	70.0	130			
silver, leachable	7440-22-4 E450	0.1	mg/kg	0.04 mg/kg	107	70.0	130			
sodium, leachable	7440-23-5 E450	100	mg/kg	20 mg/kg	102	70.0	130			
strontium, leachable	7440-24-6 E450	0.5	mg/kg	0.2 mg/kg	108	70.0	130			
thallium, leachable	7440-28-0 E450	0.05	mg/kg	0.04 mg/kg	101	70.0	130			
tin, leachable	7440-31-5 E450	2	mg/kg	0.2 mg/kg	103	70.0	130			
titanium, leachable	7440-32-6 E450	1	mg/kg	0.4 mg/kg	96.1	70.0	130			
uranium, leachable	7440-61-1 E450	0.05	mg/kg	0.04 mg/kg	99.3	70.0	130			
vanadium, leachable	7440-62-2 E450	0.2	mg/kg	1 mg/kg	103	70.0	130			
zinc, leachable	7440-66-6 E450	1	mg/kg	4 mg/kg	95.3	70.0	130			
Carbonate Metals (QCLot: 687058)								I		
aluminum, leachable	7429-90-5 E450A	50	mg/kg	2 mg/kg	102	70.0	130			
antimony, leachable	7440-36-0 E450A	0.1	mg/kg	0.2 mg/kg	104	70.0	130			
arsenic, leachable	7440-38-2 E450A	0.05	mg/kg	0.2 mg/kg	101	70.0	130			

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Sub-Matrix: Soil/Solid				Laboratory Control Sample (LCS) Report							
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Carbonate Metals (QCLot: 687058) -	continued										
barium, leachable	7440-39-3	E450A	2	mg/kg	0.2 mg/kg	98.6	70.0	130			
beryllium, leachable	7440-41-7	E450A	0.2	mg/kg	0.4 mg/kg	99.1	70.0	130			
bismuth, leachable	7440-69-9	E450A	0.2	mg/kg	0.1 mg/kg	93.2	70.0	130			
cadmium, leachable	7440-43-9	E450A	0.05	mg/kg	0.04 mg/kg	101	70.0	130			
calcium, leachable	7440-70-2	E450A	50	mg/kg	40 mg/kg	97.0	70.0	130			
chromium, leachable	7440-47-3	E450A	5	mg/kg	0.4 mg/kg	97.4	70.0	130			
cobalt, leachable	7440-48-4	7440-48-4 E450A			0.2 mg/kg	97.2	70.0	130			
copper, leachable	7440-50-8	E450A	0.5	mg/kg	0.2 mg/kg	96.0	70.0	130			
iron, leachable	7439-89-6	E450A	50	mg/kg	20 mg/kg	94.3	70.0	130			
lead, leachable	7439-92-1	E450A	0.5	mg/kg	0.2 mg/kg	94.8	70.0	130			
lithium, leachable	7439-93-2	E450A	5	mg/kg	1 mg/kg	99.2	70.0	130			
manganese, leachable	7439-96-5	E450A	5	mg/kg	0.2 mg/kg	98.6	70.0	130			
molybdenum, leachable	7439-98-7	E450A	0.5	mg/kg	0.2 mg/kg	107	70.0	130			
nickel, leachable	7440-02-0	E450A	2	mg/kg	0.4 mg/kg	97.4	70.0	130			
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	100 mg/kg	101	70.0	130			
selenium, leachable	7782-49-2	E450A	0.2	mg/kg	0.4 mg/kg	100	70.0	130			
silver, leachable	7440-22-4	E450A	0.1	mg/kg	0.04 mg/kg	103	70.0	130			
strontium, leachable	7440-24-6	E450A	5	mg/kg	0.2 mg/kg	104	70.0	130			
thallium, leachable	7440-28-0	E450A	0.05	mg/kg	0.04 mg/kg	93.8	70.0	130			
tin, leachable	7440-31-5	E450A	2	mg/kg	0.2 mg/kg	101	70.0	130			
titanium, leachable	7440-32-6	E450A	5	mg/kg	0.4 mg/kg	100	70.0	130			
uranium, leachable	7440-61-1	E450A	0.05	mg/kg	0.04 mg/kg	98.1	70.0	130			
vanadium, leachable	7440-62-2	E450A	0.2	mg/kg	1 mg/kg	102	70.0	130			
zinc, leachable	7440-66-6	E450A	1	mg/kg	4 mg/kg	95.4	70.0	130			
					3 3						
Easily Reducible Metals and Iron Ox	ides (QCLot: 690795)										
aluminum, leachable	7429-90-5	E450B	50	mg/kg	2 mg/kg	97.3	70.0	130			
antimony, leachable	7440-36-0	E450B	0.1	mg/kg	0.2 mg/kg	92.1	70.0	130			
arsenic, leachable	7440-38-2	E450B	0.05	mg/kg	0.2 mg/kg	106	70.0	130			
barium, leachable	7440-39-3	E450B	0.5	mg/kg	0.2 mg/kg	101	70.0	130			
beryllium, leachable	7440-41-7	E450B	0.2	mg/kg	0.4 mg/kg	91.3	70.0	130			
bismuth, leachable	7440-69-9	E450B	0.2	mg/kg	0.1 mg/kg	85.0	70.0	130			
cadmium, leachable	7440-43-9	E450B	0.05	mg/kg	0.04 mg/kg	103	70.0	130			
calcium, leachable	7440-70-2	E450B	50	mg/kg	40 mg/kg	91.5	70.0	130			
chromium, leachable	7440-47-3	E450B	0.5	mg/kg	0.4 mg/kg	101	70.0	130			
cobalt, leachable	it, leachable 7440-48-4 E450B 0.1 mg/kg		mg/kg	0.2 mg/kg	102	70.0	130				
copper, leachable	7440-50-8	E450B	0.5	mg/kg	0.2 mg/kg	104	70.0	130			
iron, leachable	7439-89-6	E450B	50	mg/kg	20 mg/kg	102	70.0	130			

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Sub-Matrix: Soil/Solid				Laboratory Control Sample (LCS) Report							
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Easily Reducible Metals and Iron Oxides	(QCLot: 690795) - coi	ntinued									
lead, leachable	7439-92-1	E450B	0.5	mg/kg	0.2 mg/kg	90.4	70.0	130			
lithium, leachable	7439-93-2	E450B	5	mg/kg	1 mg/kg	90.4	70.0	130			
manganese, leachable	7439-96-5	E450B	1	mg/kg	0.2 mg/kg	102	70.0	130			
molybdenum, leachable	7439-98-7	E450B	0.5	mg/kg	0.2 mg/kg	92.1	70.0	130			
nickel, leachable	7440-02-0	E450B	0.5	mg/kg	0.4 mg/kg	103	70.0	130			
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	100 mg/kg	108	70.0	130			
selenium, leachable	7782-49-2 E450B		0.2	mg/kg	0.4 mg/kg	122	70.0	130			
silver, leachable	7440-22-4	E450B	0.1	mg/kg	0.04 mg/kg	95.9	70.0	130			
strontium, leachable	7440-24-6	E450B	0.5	mg/kg	0.2 mg/kg	93.9	70.0	130			
thallium, leachable	7440-28-0	E450B	0.05	mg/kg	0.04 mg/kg	88.0	70.0	130			
tin, leachable	7440-31-5	E450B	2	mg/kg	0.2 mg/kg	91.3	70.0	130			
titanium, leachable	7440-32-6	E450B	1	mg/kg	0.4 mg/kg	101	70.0	130			
uranium, leachable	7440-61-1	E450B	0.05	mg/kg	0.04 mg/kg	90.2	70.0	130			
vanadium, leachable	7440-62-2	E450B	0.2	mg/kg	1 mg/kg	103	70.0	130			
zinc, leachable	7440-66-6	E450B	1	mg/kg	4 mg/kg	102	70.0	130			
Organic Bound Metals (QCLot: 693060)											
aluminum, leachable	7429-90-5	E450C	50	mg/kg	2 mg/kg	98.7	70.0	130			
antimony, leachable	7440-36-0	E450C	0.1	mg/kg	0.2 mg/kg	103	70.0	130			
arsenic, leachable	7440-38-2	E450C	0.05	mg/kg	0.2 mg/kg	101	70.0	130			
barium, leachable	7440-39-3	E450C	0.5	mg/kg	0.2 mg/kg	100	70.0	130			
beryllium, leachable	7440-41-7	E450C	0.2	mg/kg	0.4 mg/kg	102	70.0	130			
bismuth, leachable	7440-69-9	E450C	0.2	mg/kg	0.1 mg/kg	99.6	70.0	130			
cadmium, leachable	7440-43-9	E450C	0.05	mg/kg	0.04 mg/kg	96.4	70.0	130			
calcium, leachable	7440-70-2	E450C	50	mg/kg	40 mg/kg	99.2	70.0	130			
chromium, leachable	7440-47-3	E450C	0.5	mg/kg	0.4 mg/kg	97.7	70.0	130			
cobalt, leachable	7440-48-4	E450C	0.1	mg/kg	0.2 mg/kg	98.9	70.0	130			
copper, leachable	7440-50-8	E450C	0.5	mg/kg	0.2 mg/kg	99.7	70.0	130			
iron, leachable	7439-89-6	E450C	50	mg/kg	20 mg/kg	98.2	70.0	130			
lead, leachable	7439-92-1	E450C	0.5	mg/kg	0.2 mg/kg	102	70.0	130			
lithium, leachable	7439-93-2	E450C	5	mg/kg	1 mg/kg	99.4	70.0	130			
manganese, leachable	7439-96-5	E450C	1	mg/kg	0.2 mg/kg	98.4	70.0	130			
molybdenum, leachable	7439-98-7	E450C	0.5	mg/kg	0.2 mg/kg	101	70.0	130			
nickel, leachable	7440-02-0	E450C	0.5	mg/kg	0.4 mg/kg	99.5	70.0	130			
selenium, leachable	7782-49-2	E450C	0.2	mg/kg	0.4 mg/kg	105	70.0	130			
silver, leachable	7440-22-4	E450C	0.1	mg/kg	0.04 mg/kg	107	70.0	130			
strontium, leachable	7440-24-6	E450C	0.5	mg/kg	0.2 mg/kg	103	70.0	130			
				5 5	0.29,9	100					

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Analyte Organic Bound Metals (QCLot: 693060) tin, leachable	CAS Number				Sniko	Pocovory (%)	Daggiram	11			
Organic Bound Metals (QCLot: 693060)	CAS Number				Spike Recovery (%) Recovery Limits (%)						
, , ,		Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
tin leachable	- continued										
uii, leachable	7440-31-5	E450C	2	mg/kg	0.2 mg/kg	96.6	70.0	130			
titanium, leachable	7440-32-6	E450C	1	mg/kg	0.4 mg/kg	97.8	70.0	130			
uranium, leachable	7440-61-1	E450C	0.05	mg/kg	0.04 mg/kg	99.5	70.0	130			
vanadium, leachable	7440-62-2	E450C	0.2	mg/kg	1 mg/kg	98.5	70.0	130			
zinc, leachable	7440-66-6	E450C	1	mg/kg	4 mg/kg	100	70.0	130			
Residual Metals (QCLot: 695138)											
aluminum, leachable	7429-90-5	E450D	50	mg/kg	2 mg/kg	100	70.0	130			
antimony, leachable	7440-36-0	E450D	0.1	mg/kg	0.2 mg/kg	95.3	70.0	130			
arsenic, leachable	7440-38-2	E450D	0.5	mg/kg	0.2 mg/kg	98.2	70.0	130			
barium, leachable	7440-39-3	E450D	2	mg/kg	0.2 mg/kg	94.9	70.0	130			
beryllium, leachable	7440-41-7	E450D	0.2	mg/kg	0.4 mg/kg	99.3	70.0	130			
bismuth, leachable	7440-69-9	E450D	0.2	mg/kg	0.1 mg/kg	86.7	70.0	130			
cadmium, leachable	7440-43-9	E450D	0.05	mg/kg	0.04 mg/kg	98.2	70.0	130			
calcium, leachable	7440-70-2	E450D	50	mg/kg	40 mg/kg	95.7	70.0	130			
chromium, leachable	7440-47-3	E450D	5	mg/kg	0.4 mg/kg	99.2	70.0	130			
cobalt, leachable	7440-48-4	E450D	0.1	mg/kg	0.2 mg/kg	99.6	70.0	130			
copper, leachable	7440-50-8	E450D	0.5	mg/kg	0.2 mg/kg	99.5	70.0	130			
iron, leachable	7439-89-6	E450D	50	mg/kg	20 mg/kg	97.2	70.0	130			
lead, leachable	7439-92-1	E450D	0.5	mg/kg	0.2 mg/kg	90.0	70.0	130			
lithium, leachable	7439-93-2	E450D	5	mg/kg	1 mg/kg	102	70.0	130			
manganese, leachable	7439-96-5	E450D	5	mg/kg	0.2 mg/kg	103	70.0	130			
molybdenum, leachable	7439-98-7	E450D	0.5	mg/kg	0.2 mg/kg	94.5	70.0	130			
nickel, leachable	7440-02-0	E450D	2	mg/kg	0.4 mg/kg	97.9	70.0	130			
selenium, leachable	7782-49-2	E450D	0.2	mg/kg	0.4 mg/kg	94.9	70.0	130			
silver, leachable	7440-22-4	E450D	0.1	mg/kg	0.04 mg/kg	100	70.0	130			
strontium, leachable	7440-24-6	E450D	5	mg/kg	0.2 mg/kg	95.6	70.0	130			
thallium, leachable	7440-28-0	E450D	0.05	mg/kg	0.04 mg/kg	91.7	70.0	130			
tin, leachable	7440-31-5	E450D	2	mg/kg	0.2 mg/kg	94.0	70.0	130			
titanium, leachable	7440-32-6	E450D	5	mg/kg	0.4 mg/kg	98.6	70.0	130			
uranium, leachable	7440-61-1	E450D	0.05	mg/kg	0.04 mg/kg	90.6	70.0	130			
vanadium, leachable	7440-62-2	E450D	0.2	mg/kg	1 mg/kg	98.5	70.0	130			
zinc, leachable	7440-66-6	E450D	1	mg/kg	4 mg/kg	98.7	70.0	130			

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Project : REGIONAL EFFECTS PROGRAM



Matrix Spike (MS) Report

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

Sub-Matrix: Soil/So	lid			Matrix Spik	Matrix Spike (MS) Report						
					Spi	ke	Recovery (%)	Recovery	Limits (%)		
aboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier	
	atic Hydrocarbons (QCL	ot: 653382)									
CG2212702-001	RG_GHBP_SE-1_2022-09-1	acenaphthene	83-32-9	E641A	0.400 mg/kg	0.5 mg/kg	102	50.0	140		
	2_N	acenaphthylene	208-96-8	E641A	0.369 mg/kg	0.5 mg/kg	93.9	50.0	140		
		acridine	260-94-6	E641A	0.438 mg/kg	0.5 mg/kg	112	50.0	140		
		anthracene	120-12-7	E641A	0.452 mg/kg	0.5 mg/kg	115	50.0	140		
		benz(a)anthracene	56-55-3	E641A	0.387 mg/kg	0.5 mg/kg	98.3	50.0	140		
		benzo(a)pyrene	50-32-8	E641A	0.356 mg/kg	0.5 mg/kg	90.5	50.0	140		
		benzo(b+j)fluoranthene	n/a	E641A	0.371 mg/kg	0.5 mg/kg	94.3	50.0	140		
		benzo(g,h,i)perylene	191-24-2	E641A	0.333 mg/kg	0.5 mg/kg	84.6	50.0	140		
		benzo(k)fluoranthene	207-08-9	E641A	0.364 mg/kg	0.5 mg/kg	92.6	50.0	140		
		chrysene	218-01-9	E641A	0.349 mg/kg	0.5 mg/kg	88.8	50.0	140		
		dibenz(a,h)anthracene	53-70-3	E641A	0.355 mg/kg	0.5 mg/kg	90.3	50.0	140		
		fluoranthene	206-44-0	E641A	0.399 mg/kg	0.5 mg/kg	102	50.0	140		
		fluorene	86-73-7	E641A	0.507 mg/kg	0.5 mg/kg	129	50.0	140		
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.435 mg/kg	0.5 mg/kg	111	50.0	140		
		methylnaphthalene, 1-	90-12-0	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140		
		methylnaphthalene, 2-	91-57-6	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140		
		naphthalene	91-20-3	E641A	0.367 mg/kg	0.5 mg/kg	93.2	50.0	140		
		phenanthrene	85-01-8	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	MS-B	
		pyrene	129-00-0	E641A	0.385 mg/kg	0.5 mg/kg	97.8	50.0	140		
		quinoline	91-22-5	E641A	0.363 mg/kg	0.5 mg/kg	92.3	50.0	140		

Qualifiers

Qualifier Description

MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

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Project : REGIONAL EFFECTS PROGRAM



Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:			Reference Material (RM) Report						
					RM Target	Recovery (%)	Recovery L	imits (%)	
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests	(QCLot: 655392)								
	RM	pH (1:2 soil:water)		E108	8.06 pH units	99.1	96.0	104	
Organic / Inorga	anic Carbon (QCLot: 658	3653)							
	RM	carbon, total [TC]		E351	1.4 %	93.2	80.0	120	
Organic / Inorga	anic Carbon (QCLot: 658	3655)							
	RM	carbon, total [TC]		E351	1.4 %	103	80.0	120	
Organic / Inorga	anic Carbon (QCLot: 659	9640)							
	RM	carbon, inorganic [IC]		E354	0.383 %	95.4	80.0	120	
Organic / Inorga	anic Carbon (QCLot: 659	9648)							
	RM	carbon, inorganic [IC]		E354	0.383 %	96.4	80.0	120	
Organic / Inorga	anic Carbon (QCLot: 659	9916)							
	RM	carbon, inorganic [IC]		E354	0.383 %	97.2	80.0	120	
Metals (QCLot:	655189)								
	RM	mercury	7439-97-6	E510	0.062 mg/kg	99.0	70.0	130	
Metals (QCLot:	655190)								
	RM	aluminum	7429-90-5	E440	9817 mg/kg	107	70.0	130	
	RM	antimony	7440-36-0	E440	3.99 mg/kg	99.7	70.0	130	
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	99.1	70.0	130	
	RM	barium	7440-39-3	E440	105 mg/kg	103	70.0	130	
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	110	70.0	130	
	RM	boron	7440-42-8	E440	8.5 mg/kg	129	40.0	160	
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	126	70.0	130	
	RM	calcium	7440-70-2	E440	31082 mg/kg	101	70.0	130	
	RM	chromium	7440-47-3	E440	101 mg/kg	106	70.0	130	
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	102	70.0	130	
	RM	copper	7440-50-8	E440	123 mg/kg	99.9	70.0	130	
	RM	iron	7439-89-6	E440	23558 mg/kg	102	70.0	130	
	RM	lead	7439-92-1	E440	267 mg/kg	101	70.0	130	
	RM	lithium	7439-93-2	E440	9.5 mg/kg	115	70.0	130	
	RM	magnesium	7439-95-4	E440	5509 mg/kg	102	70.0	130	

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 : 24 of 24

 Work Order
 : CG2212702

 Client
 : Teck Coal Limited



Sub-Matrix:			Reference Material (RM) Report							
					RM Target	Recovery (%)	Recovery	imits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number Method		Concentration	RM	Low	High	Qualifier	
Metals (QCLot:	: 655190) - continued									
	RM	manganese	7439-96-5	E440	269 mg/kg	106	70.0	130		
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	113	70.0	130		
	RM	nickel	7440-02-0	E440	26.7 mg/kg	103	70.0	130		
	RM	phosphorus	7723-14-0	E440	752 mg/kg	98.1	70.0	130		
	RM	potassium	7440-09-7	E440	1587 mg/kg	114	70.0	130		
	RM	silver	7440-22-4	E440	4.06 mg/kg	79.8	70.0	130		
	RM	sodium	7440-23-5	E440	797 mg/kg	110	70.0	130		
	RM	strontium	7440-24-6	E440	86.1 mg/kg	104	70.0	130		
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	118	40.0	160		
	RM	tin	7440-31-5	E440	10.6 mg/kg	114	70.0	130		
	RM	titanium	7440-32-6	E440	839 mg/kg	113	70.0	130		
	RM	uranium	7440-61-1	E440	0.52 mg/kg	104	70.0	130		
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	104	70.0	130		
	RM	zinc	7440-66-6	E440	297 mg/kg	100	70.0	130		
	RM	zirconium	7440-67-7	E440	5.73 mg/kg	109	70.0	130		

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	ASAP or Weekend - Contact ALS	Siness days) - 50% surcharge	4	- subject to availability)				ē."	NTS/SPECIAL INSTRUCTIONS	RG_GANF	RG_GANF	RG_GANF	RG_GANF	RG_GANF	RG_GHBP	RG_GHBP	RG_GHBP	RG_GHBP	RG_GHBP	Sample Location (sys loc code)	•	Ž.	SAMPLE DE	1-250-865-3048	V0B 2G0	City Sparwood	Address 421 Pine Avenue	ck.com	r Giovanna Diaz	Facility Name / Job# Regional Effects Program	COC ID: REP	
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	Sampler's Signature	Sampler's Name				, '	*	Jennifer I	RELINQUISHED BY/AFFILIATION	2022/09/13	2022/09/13	2022/09/13	2022/09/13	2022/09/13	2022/09/12	2022/09/12	2022/09/12	2022/09/12	2022/09/12	Date		٨			ada						2022-09_ALS	
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ALS Canada Ltd.



CERTIFICATE OF ANALYSIS

Work Order : **CG2213407** Page : 1 of 18

Client : Teck Coal Limited Laboratory : Calgary - Environmental

Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets

Address : 421 Pine Avenue Address : 2559 20th Street NE

: 421 Pine Avenue Address : 2559 29th Street NE

 Sparwood BC Canada V0B2G0
 Calgary AB Canada T1Y 7B5

 Telephone
 : -- Telephone
 : +1 403 407 1800

Project : REGIONAL EFFECTS PROGRAM Date Samples Received : 27-Sep-2022 14:00

Sampler :.lennifer Ings

Sampler : Jennifer Ings Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 6
No. of samples analysed : 6

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Sask Soils, Saskatoon, Saskatchewan	
Kelsey Schaefer	Lab Analyst	Organics, Calgary, Alberta	
Kevin Baxter		Metals, Calgary, Alberta	
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia	
Sorina Motea	Laboratory Analyst	Organics, Calgary, Alberta	
Vishnu Patel		Inorganics, Calgary, Alberta	

Page : 2 of 18 Work Order : CG2213407

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



General Comments

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

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

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

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

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

Unit	Description
-	No Unit
%	percent
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

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

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

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

Sample Comments

Sample	Client Id	Comment
CG2213407-001	RG_GHP_SE-1_LAEMP_GC_2 022-09-20 N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2213407-003	RG_GHP_SE-3_LAEMP_GC_2 022-09-19 N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2213407-004	RG_GHP_SE-4_LAEMP_GC_2 022-09-19 N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.
CG2213407-005	RG_GHP_SE-5_LAEMP_GC_2 022-09-19_N	Sample(s) XXX: Limited sample was available for PSA (100g minimum is standard). Measurement Uncertainty for PSA results may be higher than usual.

>: greater than.

Page : 3 of 18 Work Order : CG2213407

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)							RG_GHP_SE-3_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-4_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-5_ LAEMP_GC_20 22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Physical Tests									
moisture		E144	0.25	%	73.0	69.0	60.5	65.5	61.2
pH (1:2 soil:water)		E108	0.10	pH units	7.80	8.09	7.94	8.04	7.85
Particle Size									
grain size curve		E185A	-	-	See	See	See Attached	See	See Attached
clay (<0.004mm)		EC184A	1.0	%	Attached 20.2	Attached 19.6	34.6	Attached 29.2	34.7
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	23.4	15.7	13.0	17.9	13.8
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	48.5	40.9	50.9	45.6	50.2
sand (0.125mm - 0.063mm)		EC184A	1.0	%	6.8	9.9	1.2	4.8	<1.0
sand (0.25mm - 0.125mm)		EC184A	1.0	%	<1.0	8.9	<1.0	2.1	<1.0
sand (0.5mm - 0.25mm)		EC184A	1.0	%	<1.0	4.0	<1.0	<1.0	<1.0
sand (1.0mm - 0.50mm)		EC184A	1.0	%	<1.0	<1.0	<1.0	<1.0	<1.0
sand (2.0mm - 1.0mm)		EC184A	1.0	%	<1.0	<1.0	<1.0	<1.0	<1.0
gravel (>2mm)		EC184A	1.0	%	<1.0	<1.0	<1.0	<1.0	<1.0
Organic / Inorganic Carbon									
carbon, total [TC], <63µm		E351A	0.050	%	20.1	21.8	19.1	26.7	20.6
carbon, inorganic [IC], <63 μm		E354A	0.050	%	2.58	3.02	1.35	1.61	1.86
carbon, total organic [TOC], <63μm		EC356A	0.050	%	17.5	18.8	17.8	25.1	18.7
Metals									
aluminum	7429-90-5	E440	50	mg/kg	7280	5120	8320	7180	8840
antimony	7440-36-0	E440	0.10	mg/kg	1.23	1.11	1.25	1.02	1.21
arsenic	7440-38-2	E440	0.10	mg/kg	4.94	3.37	6.30	5.28	6.71
barium	7440-39-3	E440	0.50	mg/kg	400	259	343	294	346
beryllium	7440-41-7	E440	0.10	mg/kg	0.63	0.46	0.83	0.70	0.86
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0.20	<0.20	0.20
boron	7440-42-8	E440	5.0	mg/kg	5.7	<5.0	5.9	5.6	<5.0
cadmium	7440-43-9	E440	0.020	mg/kg	1.46	1.32	1.40	1.16	1.52
calcium	7440-70-2	E440	50	mg/kg	104000	180000	48300	55700	60300

Page 4 of 18 Work Order : CG2213407 Client

Teck Coal Limited

Project REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)			Cl	ient sample ID	RG_GHP_SE-1_ LAEMP_GC_20 22-09-20_N	RG_GHP_SE-2_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-3_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-4_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-5_ LAEMP_GC_20 22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Metals									
chromium	7440-47-3	E440	0.50	mg/kg	11.4	8.18	13.5	10.9	13.7
cobalt	7440-48-4	E440	0.10	mg/kg	8.92	6.85	11.3	8.58	12.2
copper	7440-50-8	E440	0.50	mg/kg	22.2	17.0	26.7	23.5	29.9
iron	7439-89-6	E440	50	mg/kg	11500	7860	14500	11400	14600
lead	7439-92-1	E440	0.50	mg/kg	10.7	8.13	13.7	11.6	14.7
lithium	7439-93-2	E440	2.0	mg/kg	7.2	5.3	8.9	7.8	8.3
magnesium	7439-95-4	E440	20	mg/kg	5900	5620	4920	4440	4880
manganese	7439-96-5	E440	1.0	mg/kg	216	176	530	215	671
mercury	7439-97-6	E510	0.0050	mg/kg	0.0822	0.0628	0.117	0.0933	0.111
molybdenum	7439-98-7	E440	0.10	mg/kg	1.54	1.15	1.68	1.36	1.83
nickel	7440-02-0	E440	0.50	mg/kg	64.5	64.4	66.6	59.0	70.6
phosphorus	7723-14-0	E440	50	mg/kg	847	697	1040	964	1040
potassium	7440-09-7	E440	100	mg/kg	1730	1260	1910	1730	2140
selenium	7782-49-2	E440	0.20	mg/kg	80.9	76.2	16.8	28.6	14.2
silver	7440-22-4	E440	0.10	mg/kg	0.35	0.26	0.45	0.39	0.44
sodium	7440-23-5	E440	50	mg/kg	81	95	66	65	70
strontium	7440-24-6	E440	0.50	mg/kg	83.7	152	59.0	58.8	65.7
sulfur	7704-34-9	E440	1000	mg/kg	6600	3400	1200	1800	1200
thallium	7440-28-0	E440	0.050	mg/kg	0.181	0.113	0.146	0.102	0.118
tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg	9.0	7.4	10.5	8.6	5.9
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg	2.87	4.16	1.24	1.42	1.25
vanadium	7440-62-2	E440	0.20	mg/kg	26.6	19.5	31.5	28.0	34.4
zinc	7440-66-6	E440	2.0	mg/kg	128	106	138	117	148
zirconium	7440-67-7	E440	1.0	mg/kg	1.8	1.1	<1.0	1.0	<1.0
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.050	mg/kg	0.540	0.430	0.435	0.738	0.469
acenaphthylene	208-96-8	E641A	0.050	mg/kg	0.078	0.058	0.066	0.101	0.068

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Work Order : CG2213407

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment			CI	ient sample ID	RG_GHP_SE-1_	RG_GHP_SE-2_	RG_GHP_SE-3_	RG_GHP_SE-4_	RG_GHP_SE-5_
(Matrix: Soil/Solid)					LAEMP_GC_20	LAEMP_GC_20	LAEMP_GC_20	LAEMP_GC_20	LAEMP_GC_20
					22-09-20_N	22-09-19_N	22-09-19_N	22-09-19_N	22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
Tilledyto					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
acridine	260-94-6	E641A	0.050	mg/kg	0.929	0.768	0.802	1.37	0.879
anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	0.354	0.245	0.260	0.398	0.276
benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	0.232	0.172	0.173	0.263	0.182
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.857	0.664	0.733	0.979	0.715
benzo(b+j+k)fluoranthene	n/a	E641A	0.075	mg/kg	0.939	0.736	0.833	1.09	0.795
benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	0.257	0.203	0.217	0.289	0.208
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	0.082	0.072	0.100	0.110	0.080
chrysene	218-01-9	E641A	0.050	mg/kg	1.85	1.30	1.47	2.04	1.49
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	0.157	0.119	0.122	0.173	0.122
fluoranthene	206-44-0	E641A	0.050	mg/kg	0.298	0.197	0.220	0.306	0.229
fluorene	86-73-7	E641A	0.050	mg/kg	1.36	1.12	1.10	2.01	1.26
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	0.130	0.098	0.093	0.133	0.096
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	7.02	5.49	5.48	9.71	5.86
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	19.5	15.5	15.0	27.7	16.0
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	12.5	10.0	9.54	18.0	10.1
naphthalene	91-20-3	E641A	0.010	mg/kg	4.09	3.33	2.98	6.31	3.16
phenanthrene	85-01-8	E641A	0.050	mg/kg	5.25	4.11	4.40	6.90	4.68
pyrene	129-00-0	E641A	0.050	mg/kg	0.540	0.434	0.489	0.680	0.481
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	0.552	0.414	0.430	0.621	0.438
IACR (CCME)		E641A	0.60	-	9.22	7.01	7.76	10.5	7.60
IACR AB (coarse)		E641A	0.10	-	0.31	0.24	0.28	0.36	0.26
IACR AB (fine)		E641A	0.10	-	0.59	0.46	0.53	0.69	0.50
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	27.2	21.5	21.2	37.9	22.5
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	16.1	12.6	12.8	21.4	13.5
Polycyclic Aromatic Hydrocarbons Surrogates									
acridine-d9	34749-75-2	E641A	0.1	%	96.3	102	98.8	102	97.2
chrysene-d12	1719-03-5	E641A	0.1	%	119	114	109	112	108
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Teck Coal Limited

Project REGIONAL EFFECTS PROGRAM



				ient sample ID	RG_GHP_SE-1_	RG_GHP_SE-2_	RG_GHP_SE-3_	RG_GHP_SE-4_	RG_GHP_SE-5_
(Matrix: Soil/Solid)					LAEMP_GC_20 22-09-20_N	LAEMP_GC_20 22-09-19_N	LAEMP_GC_20 22-09-19_N	LAEMP_GC_20 22-09-19_N	LAEMP_GC_20 22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons Surrogates									
naphthalene-d8	1146-65-2	E641A	0.1	%	82.2	93.3	89.1	84.3	89.2
phenanthrene-d10	1517-22-2	E641A	0.1	%	105	110	109	110	108
Exchangeable & Adsorbed Metals									
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	<0.050	0.067	<0.050
barium, leachable	7440-39-3	E450	0.50	mg/kg	21.4	9.14	22.6	22.9	18.8
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450	0.050	mg/kg	<0.050	<0.050	0.180	0.092	0.179
calcium, leachable	7440-70-2	E450	50	mg/kg	3910	3360	3600	3160	3340
chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.25	0.18	0.39	0.32	0.30
copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450	1.0	mg/kg	17.4	13.2	124	37.3	134
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450	0.50	mg/kg	1.63	1.96	1.99	1.83	1.94
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	<50	<50	<50
potassium, leachable	7440-09-7	E450	100	mg/kg	110	130	140	160	130
selenium, leachable	7782-49-2	E450	0.20	mg/kg	0.61	1.66	0.31	0.54	0.33
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	<100	<100	<100
strontium, leachable	7440-24-6	E450	0.50	mg/kg	6.16	5.45	5.61	4.60	5.04
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0

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Teck Coal Limited

Project REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)			CI	ient sample ID	RG_GHP_SE-1_ LAEMP_GC_20 22-09-20_N	RG_GHP_SE-2_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-3_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-4_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-5_ LAEMP_GC_20 22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Exchangeable & Adsorbed Metals									
uranium, leachable	7440-61-1	E450	0.050	mg/kg	0.517	0.426	0.091	0.173	0.109
vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Carbonate Metals									
aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.087	0.121	<0.050	0.119	0.052
barium, leachable	7440-39-3	E450A	2.0	mg/kg	68.4	49.8	56.1	52.6	57.4
beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.442	0.335	0.531	0.536	0.623
calcium, leachable	7440-70-2	E450A	50	mg/kg	44000	47200	30500	37400	40800
chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	1.81	1.09	1.32	1.37	1.03
copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	0.59	1.12	<0.50
lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450A	5.0	mg/kg	80.3	63.2	146	70.1	177
molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450A	2.0	mg/kg	13.4	11.9	10.9	11.6	11.0
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	<50	<50	<50
selenium, leachable	7782-49-2	E450A	0.20	mg/kg	0.20	0.80	<0.20	0.22	0.20
silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450A	5.0	mg/kg	26.2	55.2	15.8	17.8	20.0
thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.979	1.60	0.214	0.364	0.265

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Teck Coal Limited

Project REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)			CI	ient sample ID	RG_GHP_SE-1_ LAEMP_GC_20 22-09-20_N	RG_GHP_SE-2_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-3_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-4_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-5_ LAEMP_GC_20 22-09-19_N
				ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Carbonate Metals									
vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450A	1.0	mg/kg	29.3	17.6	17.7	23.9	15.4
Easily Reducible Metals and Iron Oxides									
aluminum, leachable	7429-90-5	E450B	50	mg/kg	435	334	660	645	589
antimony, leachable	7440-36-0	E450B	0.10	mg/kg	0.11	0.13	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	1.45	0.626	0.496	0.888	0.388
barium, leachable	7440-39-3	E450B	0.50	mg/kg	42.3	60.9	51.7	40.1	45.4
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.29	0.22	0.35	0.38	0.36
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.858	0.797	0.530	0.500	0.527
calcium, leachable	7440-70-2	E450B	50	mg/kg	39400	104000	6140	5700	6820
chromium, leachable	7440-47-3	E450B	0.50	mg/kg	1.39	0.97	0.97	1.03	0.97
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	3.58	2.74	5.73	3.59	5.74
copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.68	<0.50	0.93	0.86	0.90
iron, leachable	7439-89-6	E450B	50	mg/kg	5310	2300	3810	3870	3460
lead, leachable	7439-92-1	E450B	0.50	mg/kg	5.64	4.41	4.59	4.02	5.06
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	67.9	59.4	198	56.2	250
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	29.9	30.5	31.7	27.1	30.3
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	52	68	114	125	72
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	5.36	9.58	1.20	1.12	0.91
silver, leachable	7440-22-4	E450B	0.10	mg/kg	<0.10	<0.10	0.14	<0.10	0.13
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	18.5	59.1	6.54	6.52	7.17
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.582	1.40	0.254	0.256	0.209
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	4.64	2.71	3.88	3.87	3.69

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Project REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)	Client sample ID				RG_GHP_SE-1_ LAEMP_GC_20 22-09-20_N	RG_GHP_SE-2_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-3_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-4_ LAEMP_GC_20 22-09-19_N	RG_GHP_SE-5_ LAEMP_GC_20 22-09-19_N
			Client samp	ling date / time	19-Sep-2022 09:15	19-Sep-2022 09:30	19-Sep-2022 09:45	19-Sep-2022 10:00	19-Sep-2022 10:15
Analyte	CAS Number	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Easily Reducible Metals and Iron Oxides									
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	66.6	59.4	55.3	43.9	53.3
Organic Bound Metals									
aluminum, leachable	7429-90-5	E450C	50	mg/kg	1510	876	1830	1570	1640
antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.823	0.365	0.420	0.370	0.421
barium, leachable	7440-39-3	E450C	0.50	mg/kg	15.5	22.3	28.1	22.3	32.1
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.126	0.110	0.101	0.094	0.116
calcium, leachable	7440-70-2	E450C	50	mg/kg	2220	2570	1400	1040	1460
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.23	2.22	4.10	3.59	3.61
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.39	0.98	1.12	0.86	1.05
copper, leachable	7440-50-8	E450C	0.50	mg/kg	12.6	9.69	9.69	8.58	9.15
iron, leachable	7439-89-6	E450C	50	mg/kg	2250	1210	1530	1360	1330
lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.72	<0.50	1.04	0.94	1.10
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	7.4	6.0	15.4	7.3	18.9
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	11.8	10.9	10.4	8.87	9.83
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	49.8	51.9	12.1	19.8	11.7
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	6.13	4.72	4.86	3.86	4.87
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	<1.0	14.4	1.0	1.5	<1.0
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.324	0.288	0.356	0.307	0.310
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.61	3.41	5.54	5.00	5.67
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	12.8	7.6	11.6	9.2	11.6
Residual Metals									

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Cub Matrice Cadimant			Cl	ient sample ID	DO OUD OF 4	DO CUD OF A	DO CUD OF A	DO OUD OF 4	DO CUD OF F
Sub-Matrix: Sediment			Oli	ient sample ib	RG_GHP_SE-1_ LAEMP GC 20	RG_GHP_SE-2_ LAEMP_GC_20	RG_GHP_SE-3_ LAEMP_GC_20	RG_GHP_SE-4_ LAEMP_GC_20	RG_GHP_SE-5_ LAEMP GC 20
(Matrix: Soil/Solid)					22-09-20 N	22-09-19 N	22-09-19_N	22-09-19 N	22-09-19 N
			Client samp	ling date / time	19-Sep-2022	19-Sep-2022	19-Sep-2022	19-Sep-2022	19-Sep-2022
					09:15	09:30	09:45	10:00	10:15
Analyte CAS Nu	mber	Method	LOR	Unit	CG2213407-001	CG2213407-002	CG2213407-003	CG2213407-004	CG2213407-005
					Result	Result	Result	Result	Result
Residual Metals	00.5	E450D	FO		eeco.	F670	9600	6220	9420
aluminum, leachable 7429		E450D	50	mg/kg	6560	5670	8690	6220	8420
antimony, leachable 7440		E450D	0.10	mg/kg	0.76	0.84	0.97	0.82	1.05
arsenic, leachable 7440		E450D	5.00	mg/kg	<5.00	<5.00	5.36	<5.00	5.38
barium, leachable 7440		E450D	2.0	mg/kg	208	105	172	136	164
beryllium, leachable 7440		E450D	0.20	mg/kg	0.28	0.28	0.43	0.35	0.44
bismuth, leachable 7440		E450D	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable 7440		E450D	0.050	mg/kg	<0.050	<0.050	0.097	0.070	0.101
calcium, leachable 7440	-70-2	E450D	50	mg/kg	250	322	109	85	97
chromium, leachable 7440		E450D	5.0	mg/kg	9.2	7.7	12.5	9.3	12.5
cobalt, leachable 7440	-48-4	E450D	0.10	mg/kg	1.50	1.64	3.39	2.79	3.61
copper, leachable 7440		E450D	0.50	mg/kg	9.93	7.62	18.4	16.5	20.2
iron, leachable 7439		E450D	50	mg/kg	4940	5030	11300	8520	11100
lead, leachable 7439	-92-1	E450D	0.50	mg/kg	3.90	2.76	7.98	6.55	8.58
lithium, leachable 7439	-93-2	E450D	5.0	mg/kg	<5.0	<5.0	5.8	<5.0	5.3
manganese, leachable 7439	-96-5	E450D	5.0	mg/kg	18.8	20.6	44.2	36.9	47.5
molybdenum, leachable 7439	-98-7	E450D	0.50	mg/kg	0.58	<0.50	1.24	1.02	1.41
nickel, leachable 7440	-02-0	E450D	2.0	mg/kg	6.4	6.5	14.3	11.3	15.4
selenium, leachable 7782	-49-2	E450D	0.20	mg/kg	16.6	12.0	3.18	6.05	3.01
silver, leachable 7440	-22-4	E450D	0.10	mg/kg	0.30	0.24	0.25	0.30	0.27
strontium, leachable 7440	-24-6	E450D	5.0	mg/kg	17.9	15.8	23.4	19.9	27.0
thallium, leachable 7440	-28-0	E450D	0.050	mg/kg	0.123	0.126	0.152	0.100	0.157
tin, leachable 7440	-31-5	E450D	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable 7440	-32-6	E450D	5.0	mg/kg	15.9	13.3	16.3	14.6	15.3
uranium, leachable 7440	-61-1	E450D	0.050	mg/kg	0.244	0.221	0.380	0.320	0.394
vanadium, leachable 7440	-62-2	E450D	0.20	mg/kg	23.8	20.4	33.5	25.9	33.5
zinc, leachable 7440	-66-6	E450D	1.0	mg/kg	31.8	34.5	77.6	61.1	80.8

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

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment			CI	lient sample ID	RG_GHP_SE-6_	 		
(Matrix: Soil/Solid)					LAEMP_GC_20			
					22-09-19_N			
			Client samp	oling date / time	20-Sep-2022 09:15	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Physical Tests								
moisture		E144	0.25	%	65.8	 		
pH (1:2 soil:water)		E108	0.10	pH units	7.95	 		
Particle Size								
grain size curve		E185A	-	-	See	 		
					Attached			
clay (<0.004mm)		EC184A	1.0	%	28.8	 		
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	20.5	 		
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	47.9	 		
sand (0.125mm - 0.063mm)		EC184A	1.0	%	1.5	 		
sand (0.25mm - 0.125mm)		EC184A	1.0	%	<1.0	 		
sand (0.5mm - 0.25mm)		EC184A	1.0	%	<1.0	 		
sand (1.0mm - 0.50mm)		EC184A	1.0	%	<1.0	 		
sand (2.0mm - 1.0mm)		EC184A	1.0	%	<1.0	 		
gravel (>2mm)		EC184A	1.0	%	<1.0	 		
Organic / Inorganic Carbon								
carbon, total [TC], <63µm		E351A	0.050	%	28.2	 		
carbon, inorganic [IC], <63 μm		E354A	0.050	%	2.10	 		
carbon, total organic [TOC], <63μm		EC356A	0.050	%	26.1	 		
Metals								
aluminum	7429-90-5	E440	50	mg/kg	7720	 		
antimony	7440-36-0	E440	0.10	mg/kg	1.11	 		
arsenic	7440-38-2	E440	0.10	mg/kg	5.77	 		
barium	7440-39-3	E440	0.50	mg/kg	285	 		
beryllium	7440-41-7	E440	0.10	mg/kg	0.81	 		
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	 		
boron	7440-42-8	E440	5.0	mg/kg	<5.0	 		
cadmium	7440-43-9	E440	0.020	mg/kg	1.30	 		
calcium	7440-70-2	E440	50	mg/kg	72000	 		
chromium	7440-47-3	E440	0.50	mg/kg	12.0	 		
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment (Matrix: Soil/Solid)			CI	ient sample ID	RG_GHP_SE-6_ LAEMP_GC_20	 		
			Client samp	ling date / time	22-09-19_N 20-Sep-2022 09:15	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Metals								
cobalt	7440-48-4	E440	0.10	mg/kg	9.74	 		
copper	7440-50-8	E440	0.50	mg/kg	25.0	 		
iron	7439-89-6	E440	50	mg/kg	11800	 		
lead	7439-92-1	E440	0.50	mg/kg	12.3	 		
lithium	7439-93-2	E440	2.0	mg/kg	7.8	 		
magnesium	7439-95-4	E440	20	mg/kg	4500	 		
manganese	7439-96-5	E440	1.0	mg/kg	585	 		
mercury	7439-97-6	E510	0.0050	mg/kg	0.0930	 		
molybdenum	7439-98-7	E440	0.10	mg/kg	1.59	 		
nickel	7440-02-0	E440	0.50	mg/kg	67.4	 		
phosphorus	7723-14-0	E440	50	mg/kg	874	 		
potassium	7440-09-7	E440	100	mg/kg	1880	 		
selenium	7782-49-2	E440	0.20	mg/kg	9.02	 		
silver	7440-22-4	E440	0.10	mg/kg	0.40	 		
sodium	7440-23-5	E440	50	mg/kg	69	 		
strontium	7440-24-6	E440	0.50	mg/kg	67.7	 		
sulfur	7704-34-9	E440	1000	mg/kg	1400	 		
thallium	7440-28-0	E440	0.050	mg/kg	0.096	 		
tin	7440-31-5	E440	2.0	mg/kg	<2.0	 		
titanium	7440-32-6	E440	1.0	mg/kg	6.7	 		
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	 		
uranium	7440-61-1	E440	0.050	mg/kg	1.08	 		
vanadium	7440-62-2	E440	0.20	mg/kg	29.9	 		
zinc	7440-66-6	E440	2.0	mg/kg	128	 		
zirconium	7440-67-7	E440	1.0	mg/kg	<1.0	 		
Polycyclic Aromatic Hydrocarbons								
acenaphthene	83-32-9	E641A	0.050	mg/kg	0.751	 		
acenaphthylene	208-96-8	E641A	0.050	mg/kg	0.111	 		
acridine	260-94-6	E641A	0.050	mg/kg	1.46	 		
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment			CI	ient sample ID	RG_GHP_SE-6_	 		
(Matrix: Soil/Solid)			0.	and the second	LAEMP_GC_20			
(Matrix: Golf/Golfa)					22-09-19_N			
					_			
			Client samp	ling date / time		 		
				11.77	09:15			
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Polycyclic Aromatic Hydrocarbons	100 10 7	EC44.A	0.050		40.050			
anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	 		
benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	0.416	 		
benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	0.290	 		
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.997	 		
benzo(b+j+k)fluoranthene	n/a	E641A	0.075	mg/kg	1.09	 		
benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	0.324	 		
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	0.091	 		
chrysene	218-01-9	E641A	0.050	mg/kg	2.21	 		
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	0.188	 		
fluoranthene	206-44-0	E641A	0.050	mg/kg	0.311	 		
fluorene	86-73-7	E641A	0.050	mg/kg	2.08	 		
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	0.137	 		
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	10.0	 		
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	28.2	 		
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	18.2	 		
naphthalene	91-20-3	E641A	0.010	mg/kg	6.28	 		
phenanthrene	85-01-8	E641A	0.050	mg/kg	7.25	 		
pyrene	129-00-0	E641A	0.050	mg/kg	0.684	 		
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	 		
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	0.667	 		
IACR (CCME)		E641A	0.60	-	10.8	 		
IACR AB (coarse)		E641A	0.10	-	0.36	 		
IACR AB (fine)		E641A	0.10	-	0.68	 		
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	38.8	 		
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	22.1	 		
Polycyclic Aromatic Hydrocarbons Surrogates								
acridine-d9	34749-75-2	E641A	0.1	%	103	 		
chrysene-d12	1719-03-5	E641A	0.1	%	116	 		
naphthalene-d8	1146-65-2	E641A	0.1	%	96.6	 		
1	1110 00-2		<u> </u>	· · · · · · · · · · · · · · · · · · ·		 	<u> </u>	l

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment			CI	ient sample ID	RG_GHP_SE-6_		 	
(Matrix: Soil/Solid)					LAEMP_GC_20 22-09-19_N			
			Client samp	ling date / time	20-Sep-2022 09:15		 	
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006		 	
					Result		 	
Polycyclic Aromatic Hydrocarbons Surrogates								
phenanthrene-d10	1517-22-2	E641A	0.1	%	114		 	
Exchangeable & Adsorbed Metals								
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50		 	
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10		 	
arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050		 	
barium, leachable	7440-39-3	E450	0.50	mg/kg	16.4		 	
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20		 	
bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20		 	
cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.111		 	
calcium, leachable	7440-70-2	E450	50	mg/kg	2960		 	
chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50		 	
cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.24		 	
copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50		 	
iron, leachable	7439-89-6	E450	50	mg/kg	<50		 	
lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50		 	
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0		 	
manganese, leachable	7439-96-5	E450	1.0	mg/kg	124		 	
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50		 	
nickel, leachable	7440-02-0	E450	0.50	mg/kg	2.31		 	
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50		 	
potassium, leachable	7440-09-7	E450	100	mg/kg	140		 	
selenium, leachable	7782-49-2	E450	0.20	mg/kg	0.25		 	
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10		 	
sodium, leachable	7440-23-5	E450	100	mg/kg	<100		 	
strontium, leachable	7440-24-6	E450	0.50	mg/kg	4.20		 	
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050		 	
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0		 	
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0		 	
uranium, leachable	7440-61-1	E450	0.050	mg/kg	0.078		 	
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Sediment			CI	ient sample ID	RG_GHP_SE-6_	 	
(Matrix: Soil/Solid)				LAEMP_GC_20			
(Matrix: 301/3011d)					22-09-19_N		
					_		
Client sampling date / time				20-Sep-2022	 	 	
		A d a dda a ad	100	11-9	09:15		
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006 Result	 	
E describe A de la Divisio					Result	 	
Exchangeable & Adsorbed Metals vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	 	
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	 	
	7440-00-0	L+00	1.0	mg/kg	11.0		
Carbonate Metals aluminum, leachable	7429-90-5	E450A	50	ma/ka	<50	 	
antimony, leachable	7440-36-0	E450A	0.10	mg/kg mg/kg	<0.10	 	
arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	<0.050	 	
barium, leachable	7440-39-3	E450A	2.0		51.4	 	
beryllium, leachable		E450A	0.20	mg/kg	<0.20	 	
bismuth, leachable	7440-41-7 7440-69-9	E450A	0.20	mg/kg mg/kg	<0.20	 	
cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.570	 	
calcium, leachable		E450A	50		44200	 	
chromium, leachable	7440-70-2	E450A	5.0	mg/kg	<5.0	 	
cobalt, leachable	7440-47-3 7440-48-4	E450A	0.10	mg/kg mg/kg	0.78	 	
copper, leachable	7440-46-4	E450A	0.50	mg/kg	<0.50	 	
iron, leachable		E450A	50		<50	 	
lead, leachable	7439-89-6	E450A	0.50	mg/kg	<0.50	 	
lithium, leachable	7439-92-1	E450A	5.0	mg/kg	<5.0	 	
manganese, leachable	7439-93-2 7439-96-5	E450A	5.0	mg/kg mg/kg	141	 	
molybdenum, leachable		E450A	0.50		<0.50	 	
nickel, leachable	7439-98-7	E450A	2.0	mg/kg	12.0	 	
phosphorus, leachable	7440-02-0	E450A	50	mg/kg	<50	 	
selenium, leachable	7723-14-0	E450A E450A	0.20	mg/kg	<0.20	 	
	7782-49-2	E450A E450A	0.20	mg/kg	<0.20	 	
silver, leachable strontium, leachable	7440-22-4	E450A E450A	5.0	mg/kg	19.6	 	
·	7440-24-6	E450A E450A	0.050	mg/kg	<0.050		
thallium, leachable	7440-28-0			mg/kg		 	
tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	 	
titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	 	
uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.246	 	
vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	 	

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Sediment			CI	lient sample ID	RG_GHP_SE-6_	 		
(Matrix: Soil/Solid)					LAEMP_GC_20 22-09-19_N			
			Client samp	oling date / time	20-Sep-2022 09:15	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Carbonate Metals								
zinc, leachable	7440-66-6	E450A	1.0	mg/kg	16.7	 		
Easily Reducible Metals and Iron Oxides								
aluminum, leachable	7429-90-5	E450B	50	mg/kg	584	 		
antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	 		
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.438	 		
barium, leachable	7440-39-3	E450B	0.50	mg/kg	33.4	 		
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.32	 		
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.425	 		
calcium, leachable	7440-70-2	E450B	50	mg/kg	8950	 		
chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.94	 		
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	4.76	 		
copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.72	 		
iron, leachable	7439-89-6	E450B	50	mg/kg	3450	 		
lead, leachable	7439-92-1	E450B	0.50	mg/kg	4.62	 		
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	 		
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	228	 		
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	 		
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	30.8	 		
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	100	 		
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	0.62	 		
silver, leachable	7440-22-4	E450B	0.10	mg/kg	0.11	 		
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	8.17	 		
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	 		
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	 		
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	 		
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.170	 		
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	3.54	 		
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	51.6	 		
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Sediment			CI	lient sample ID	RG_GHP_SE-6_	 		
(Matrix: Soil/Solid)				and the second	LAEMP_GC_20			
(Matrix: Golf/Golfa)					22-09-19_N			
					_			
			Client samp	oling date / time		 		
		A 4 - 411	100	11-4	09:15			
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Organic Bound Metals	7400.00.5	E450C	50		1420			
aluminum, leachable	7429-90-5	E450C	50 0.10	mg/kg	1420 <0.10	 		
antimony, leachable	7440-36-0	E450C		mg/kg		 		
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.434	 		
barium, leachable	7440-39-3	E450C	0.50	mg/kg	30.3	 		
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	 		
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.105	 		
calcium, leachable	7440-70-2	E450C	50	mg/kg	1280	 		
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.07	 		
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	0.76	 		
copper, leachable	7440-50-8	E450C	0.50	mg/kg	7.79	 		
iron, leachable	7439-89-6	E450C	50	mg/kg	1140	 		
lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.95	 		
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	 		
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	13.4	 		
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	 		
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	8.24	 		
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	6.80	 		
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	 		
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.23	 		
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	 		
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	 		
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	10.1	 		
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.246	 		
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	5.12	 		
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	9.8	 		
Residual Metals								
aluminum, leachable	7429-90-5	E450D	50	mg/kg	6970	 		
antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.79	 		
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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Analytical Results

Sub-Matrix: Sediment (Matrix: Soil/Solid)			Cl	lient sample ID	RG_GHP_SE-6_ LAEMP_GC_20 22-09-19_N	 		
			Client samp	ling date / time	20-Sep-2022 09:15	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213407-006	 		
					Result	 		
Residual Metals								
arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	 		
barium, leachable	7440-39-3	E450D	2.0	mg/kg	124	 		
beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.39	 		
bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.072	 		
calcium, leachable	7440-70-2	E450D	50	mg/kg	90	 		
chromium, leachable	7440-47-3	E450D	5.0	mg/kg	10.2	 		
cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.85	 		
copper, leachable	7440-50-8	E450D	0.50	mg/kg	17.0	 		
iron, leachable	7439-89-6	E450D	50	mg/kg	8550	 		
lead, leachable	7439-92-1	E450D	0.50	mg/kg	6.35	 		
lithium, leachable	7439-93-2	E450D	5.0	mg/kg	<5.0	 		
manganese, leachable	7439-96-5	E450D	5.0	mg/kg	39.0	 		
molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	1.00	 		
nickel, leachable	7440-02-0	E450D	2.0	mg/kg	11.7	 		
selenium, leachable	7782-49-2	E450D	0.20	mg/kg	1.67	 		
silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.20	 		
strontium, leachable	7440-24-6	E450D	5.0	mg/kg	23.7	 		
thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.091	 		
tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	 		
titanium, leachable	7440-32-6	E450D	5.0	mg/kg	12.1	 		
uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.300	 		
vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	27.8	 		
zinc, leachable	7440-66-6	E450D	1.0	mg/kg	65.4	 		
4			1				I	

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



QUALITY CONTROL INTERPRETIVE REPORT

Work Order : **CG2213407** Page : 1 of 19

Client : Teck Coal Limited Laboratory : Calgary - Environmental
Contact : Giovanna Diaz Account Manager : Lyudmyla Shyets

Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets
Address : 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

Telephone : +1 403 407 1800

 Project
 : REGIONAL EFFECTS PROGRAM
 Date Samples Received
 : 27-Sep-2022 14:00

 PO
 : VPO00816101
 Issue Date
 : 20-Oct-2022 18:27

C-O-C number : REP LAEMP GC 2022-09 ALS

Sampler : Jennifer Ings
Site :----

Quote number : Teck Coal Master Quote

No. of samples received :6
No. of samples analysed :6

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

No Reference Material (RM) Sample outliers occur.

Outliers: Analysis Holding Time Compliance (Breaches) ● Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

• No Quality Control Sample Frequency Outliers occur.

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Client Teck Coal Limited

REGIONAL EFFECTS PROGRAM **Project**



Outliers: Quality Control Samples
Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: Soil/Solid

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Exchangeable & Adsorbed Metals	QC-695314-001		barium, leachable	7440-39-3	E450	0.63 ^B	0.5 mg/kg	Blank result exceeds
						mg/kg		permitted value

Result Qualifiers

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.

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Project : REGIONAL EFFECTS PROGRAM



Analysis Holding Time Compliance

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

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

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

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

Matrix: Soil/Solid Evaluation: × = Holding time exceedance; √ = Within Holding Time

Analyte Group	Method	Sampling Date	Ext	traction / Pi			Holding time excee	Analy		<u> </u>
Container / Client Sample ID(s)		, , ,	Preparation		g Times	Eval	Analysis Date	Holdin	g Times	Eval
			Date	Rec	Actual		,	Rec	Actual	
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E450A	20-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	25 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E450A	19-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	26 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E450A	19-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	26 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E450A	19-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	26 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E450A	19-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	26 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E450A	19-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	26 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extracti	on #3)									
Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E450B	20-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	26 days	✓

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Client : Teck Coal Limited



Matrix: Soil/Solid					Ev	/aluation: 🗴 =	Holding time excee	edance ;	✓ = Within	Holding Tin
Analyte Group	Method	Sampling Date	Ex	traction / Pr	eparation		Analy		sis	
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	n #3)									
Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E450B	19-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	27 days	√
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extractio	n #3)									
Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E450B	19-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	27 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extractio	on #3)									
Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E450B	19-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	27 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	n #3)									
Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E450B	19-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	27 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	n #3)								<u>'</u>	
Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E450B	19-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	27 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E450	20-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	25 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E450	19-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	26 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E450	19-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	26 days	✓
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E450	19-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	26 days	✓

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Client : Teck Coal Limited



Matrix: Soil/Solid					Ev	/aluation: 🗴 =	Holding time exce	edance ; 🔹	/ = Within	Holding Tin
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E450	19-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	26 days	√
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)										
Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E450	19-Sep-2022	13-Oct-2022				14-Oct-2022	180 days	26 days	√
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E510	19-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	16 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E510	19-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	16 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E510	20-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	16 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E510	19-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	17 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E510	19-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	17 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E510	19-Sep-2022	04-Oct-2022				05-Oct-2022	28 days	17 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS									1	
Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E440	19-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	16 days	✓

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Client : Teck Coal Limited



Matrix: Soil/Solid					Ev	/aluation: 🗴 =	Holding time excee	edance ;	✓ = Within	Holding Tim
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation		Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E440	19-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	16 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E440	20-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	16 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E440	19-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	17 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E440	19-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	17 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E440	19-Sep-2022	04-Oct-2022				05-Oct-2022	180 days	17 days	✓
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 μm)										
RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E351A	19-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 µm)										
LDPE bag RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E351A	19-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 µm)										
LDPE bag RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E351A	19-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 μm)										
LDPE bag RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E351A	19-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	

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Client : Teck Coal Limited



Matrix: Soil/Solid						aluation: 🗴 =	Holding time excee	edance ; •	✓ = Within	Holding Tin
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	sis	
Container / Client Sample ID(s)			Preparation		7 Times	Eval	Analysis Date		g Times	Eval
Operation (Incomparis Contract Table Contract to Comparison (400 cm)			Date	Rec	Actual			Rec	Actual	
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 µm)										
RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E351A	19-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	
Organic / Inorganic Carbon : Total Carbon by Combustion (<63 μm)										
LDPE bag										
RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E351A	20-Sep-2022	08-Oct-2022				08-Oct-2022		0 days	
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag										
RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E354A	19-Sep-2022					12-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag	F0544	40.0 0000								
RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E354A	19-Sep-2022					12-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag	50544	40.0 0000					40.0.4.0000			
RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E354A	19-Sep-2022					12-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag	50544	40.00000					40.0.4.0000			
RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E354A	19-Sep-2022					12-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag	50544	40.0 0000					40.0.4.0000			
RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E354A	19-Sep-2022					12-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve (<63 µm)									
LDPE bag										
RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E354A	20-Sep-2022					12-Oct-2022			
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap	F4500	00.00000	10.00:0000				40.0.1.0005		00.1	
RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E450C	20-Sep-2022	18-Oct-2022				19-Oct-2022	180 days	29 days	✓

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 Work Order
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 CG2213407

Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix: Soil/Solid Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date **Holding Times** Eval Rec Actual Rec Actual Date Organic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) Glass soil jar/Teflon lined cap E450C 19-Sep-2022 18-Oct-2022 ✓ RG GHP SE-1 LAEMP GC 2022-09-20 N 19-Oct-2022 30 days 180 days Organic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N E450C 19-Sep-2022 18-Oct-2022 19-Oct-2022 30 days ✓ 180 days Organic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) Glass soil jar/Teflon lined cap E450C 19-Sep-2022 18-Oct-2022 19-Oct-2022 30 days ✓ RG GHP SE-3 LAEMP GC 2022-09-19 N 180 days Organic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) Glass soil jar/Teflon lined cap E450C RG_GHP_SE-4_LAEMP_GC_2022-09-19_N 19-Sep-2022 18-Oct-2022 19-Oct-2022 30 days ✓ 180 days Organic Bound Metals: Metals by CRC ICPMS (Tessier Extraction #4) Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N E450C 19-Sep-2022 18-Oct-2022 19-Oct-2022 ✓ 30 days 180 days Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag 19-Sep-2022 RG GHP SE-1 LAEMP GC 2022-09-20 N E185A 12-Oct-2022 365 -------days Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag RG GHP SE-2 LAEMP GC 2022-09-19 N E185A 08-Oct-2022 19-Sep-2022 365 days Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag RG_GHP_SE-3_LAEMP_GC_2022-09-19_N E185A 19-Sep-2022 12-Oct-2022 365 days Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag E185A 19-Sep-2022 12-Oct-2022 RG_GHP_SE-4_LAEMP_GC_2022-09-19_N 365 days

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Client : Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Matrix: Soil/Solid Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag E185A 19-Sep-2022 12-Oct-2022 RG GHP SE-5 LAEMP GC 2022-09-19 N 365 days Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag RG_GHP_SE-6_LAEMP_GC_2022-09-19_N E185A 20-Sep-2022 08-Oct-2022 365 -------days **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap E144 19-Sep-2022 04-Oct-2022 RG_GHP_SE-1_LAEMP_GC_2022-09-20_N ----**Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N E144 19-Sep-2022 04-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG_GHP_SE-3_LAEMP_GC_2022-09-19_N E144 19-Sep-2022 04-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap 19-Sep-2022 RG_GHP_SE-4_LAEMP_GC_2022-09-19_N E144 04-Oct-2022 ------------**Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG_GHP_SE-5_LAEMP_GC_2022-09-19_N E144 19-Sep-2022 04-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG_GHP_SE-6_LAEMP_GC_2022-09-19_N E144 20-Sep-2022 04-Oct-2022 Physical Tests : pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 20-Sep-2022 05-Oct-2022 05-Oct-2022 30 days 15 days 1 RG_GHP_SE-6_LAEMP_GC_2022-09-19_N

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Matrix: Soil/Solid Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 19-Sep-2022 ✓ RG_GHP_SE-1_LAEMP_GC_2022-09-20_N 05-Oct-2022 05-Oct-2022 30 days 16 days Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap RG_GHP_SE-2_LAEMP_GC_2022-09-19_N E108 19-Sep-2022 05-Oct-2022 05-Oct-2022 30 days 16 days ✓ Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 19-Sep-2022 05-Oct-2022 05-Oct-2022 30 days 16 days ✓ RG GHP SE-3 LAEMP GC 2022-09-19 N ----Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap RG_GHP_SE-4_LAEMP_GC_2022-09-19_N E108 19-Sep-2022 05-Oct-2022 05-Oct-2022 30 days 16 days ✓ Physical Tests : pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 19-Sep-2022 05-Oct-2022 05-Oct-2022 ✓ RG_GHP_SE-5_LAEMP_GC_2022-09-19_N 30 days 16 days Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS Glass soil iar/Teflon lined cap 1 ✓ RG GHP SE-6 LAEMP GC 2022-09-19 N E641A 20-Sep-2022 04-Oct-2022 14 14 04-Oct-2022 40 days 0 days days days Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap RG_GHP_SE-1_LAEMP_GC_2022-09-20_N E641A 19-Sep-2022 04-Oct-2022 æ 04-Oct-2022 40 days ✓ 0 days 14 15 EHT days days Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap ✓ RG_GHP_SE-2_LAEMP_GC_2022-09-19_N E641A 19-Sep-2022 04-Oct-2022 × 04-Oct-2022 40 days 0 days 14 15 **EHT** days days Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap E641A 19-Sep-2022 04-Oct-2022 04-Oct-2022 40 days 0 days ✓ RG_GHP_SE-3_LAEMP_GC_2022-09-19_N × 14 15 EHT days days

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Matrix: Soil/Solid Evaluation: ★ = Holding time exceedance; ✓ = W									
Analyte Group	Method	Sampling Date	Extraction / Preparation		Analysis				

Analyte Group	Method	Sampling Date	Extraction / Preparation							
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap										
RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E641A	19-Sep-2022	04-Oct-2022	14	15	*	04-Oct-2022	40 days	0 days	✓
				days	days	EHT				
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap										
RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E641A	19-Sep-2022	04-Oct-2022	14	15	*	04-Oct-2022	40 days	0 days	✓
				days	days	EHT				
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
Glass soil jar/Teflon lined cap										
RG_GHP_SE-6_LAEMP_GC_2022-09-19_N	E450D	20-Sep-2022	19-Oct-2022				20-Oct-2022	180	30 days	✓
								days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
Glass soil jar/Teflon lined cap										
RG_GHP_SE-1_LAEMP_GC_2022-09-20_N	E450D	19-Sep-2022	19-Oct-2022				20-Oct-2022	180	31 days	✓
								days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
Glass soil jar/Teflon lined cap										
RG_GHP_SE-2_LAEMP_GC_2022-09-19_N	E450D	19-Sep-2022	19-Oct-2022				20-Oct-2022	180	31 days	✓
								days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
Glass soil jar/Teflon lined cap	E 450D	40.0 0000								,
RG_GHP_SE-3_LAEMP_GC_2022-09-19_N	E450D	19-Sep-2022	19-Oct-2022				20-Oct-2022	180	31 days	✓
								days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)										
Glass soil jar/Teflon lined cap	E450D	40.0 0000	40.04.0000				00.0.4.0000		04 1	√
RG_GHP_SE-4_LAEMP_GC_2022-09-19_N	E450D	19-Sep-2022	19-Oct-2022				20-Oct-2022	180	31 days	✓
								days		
Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM)				1						
Glass soil jar/Teflon lined cap	E450D	40.0 0000	10.0-+ 2000				20.0-4.2022		24 -	,
RG_GHP_SE-5_LAEMP_GC_2022-09-19_N	E450D	19-Sep-2022	19-Oct-2022				20-Oct-2022	180	31 days	✓
								days		

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

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

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Quality Control Parameter Frequency Compliance

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

Quality Control Sample Type			Co	ount		Frequency (%)
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)						,	
Mercury in Soil/Solid by CVAAS	E510	680465	1	19	5.2	5.0	1
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	√
Metals in Soil/Solid by CRC ICPMS	E440	680466	1	19	5.2	5.0	✓
Moisture Content by Gravimetry	E144	679063	1	6	16.6	5.0	<u> </u>
PAHs by Hex:Ace GC-MS	E641A	679062	1	6	16.6	5.0	√
pH by Meter (1:2 Soil:Water Extraction)	E108	681792	1	6	16.6	5.0	1
Total Carbon by Combustion (<63 μm)	E351A	686565	1	15	6.6	5.0	√
Total Inorganic Carbon by Acetic Acid pH Standard Curve (<63 µm)	E354A	691434	1	13	7.6	5.0	√
Laboratory Control Samples (LCS)							_
Mercury in Soil/Solid by CVAAS	E510	680465	2	19	10.5	10.0	1
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	<u>√</u>
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	<u>√</u>
Metals in Soil/Solid by CRC ICPMS	E440	680466	2	19	10.5	10.0	1
Moisture Content by Gravimetry	E144	679063	1	6	16.6	5.0	√
PAHs by Hex:Ace GC-MS	E641A	679062	1	6	16.6	5.0	1
pH by Meter (1:2 Soil:Water Extraction)	E108	681792	2	6	33.3	10.0	<u>√</u>
Total Carbon by Combustion (<63 μm)	E351A	686565	2	15	13.3	10.0	√
Total Inorganic Carbon by Acetic Acid pH Standard Curve (<63 µm)	E354A	691434	2	13	15.3	10.0	1
Method Blanks (MB)							
Mercury in Soil/Solid by CVAAS	E510	680465	1	19	5.2	5.0	1
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	<u>√</u>
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	√
Metals in Soil/Solid by CRC ICPMS	E440	680466	1	19	5.2	5.0	✓
Moisture Content by Gravimetry	E144	679063	1	6	16.6	5.0	√
PAHs by Hex:Ace GC-MS	E641A	679062	1	6	16.6	5.0	1

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Matrix: Soil/Solid		Evaluation	n: × = QC freque	ency outside spe	ecification; ✓ = 0	QC frequency wit	hin specification.	
Quality Control Sample Type			Co	ount		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Method Blanks (MB) - Continued								
Total Carbon by Combustion (<63 μm)	E351A	686565	1	15	6.6	5.0	✓	
Total Inorganic Carbon by Acetic Acid pH Standard Curve (<63 μm)	E354A	691434	1	13	7.6	5.0	✓	
Matrix Spikes (MS)								
PAHs by Hex:Ace GC-MS	E641A	679062	1	6	16.6	5.0	✓	

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient
				laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with
	Calgary - Environmental			procedures described in the BC Lab Manual (prescriptive method). The procedure
				involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure
				water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH
				probe.
Moisture Content by Gravimetry	E144	Soil/Solid	CCME PHC in Soil - Tier	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is
			1	calculated as the weight loss (due to water) divided by the wet weight of the sample,
	Calgary - Environmental			expressed as a percentage.
Grain Size Report (Attachment) Pipet/Sieve	E185A	Soil/Solid	SSIR-51 Method 3.2.1	A grain size curve is a graphical representation of the particle sizing of a sample
Method				representing the percent passing against the effective particle size.
	Saskatoon -			
	Environmental			
Total Carbon by Combustion (<63 μm)	E351A	Soil/Solid	CSSS (2008) 21.2	Total Carbon is determined on a sample which is first sieved through a 63 µm sieve prior
			(mod)	to analysis by the high temperature combustion method with measurement by an
	Saskatoon -			infrared detector.
	Environmental			
Total Inorganic Carbon by Acetic Acid pH	E354A	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined on a sample which is first sieved through a 63 µm
Standard Curve (<63 µm)				sieve prior to analysis by acetic acid pH standard curve, where a known quantity of
	Saskatoon -			acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting
	Environmental			solution is measured and compared against a standard curve relating pH to weight of
				carbonate.
Metals in Soil/Solid by CRC ICPMS	E440	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available.
				Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl.
	Calgary - Environmental			
				Dependent on sample matrix, some metals may be only partially recovered, including Al,
				Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms
				of sulfur (including sulfide) may not be captured, as they may be lost during sampling,
				storage, or digestion. This method does not adequately recover elemental sulfur, and is
				unsuitable for assessment of elemental sulfur standards or guidelines.
				Analysis is by Collision/Reaction Cell ICPMS.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #1)	E450 Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision/Reaction Cell ICPMS. Note: For Extraction #1, the extraction solution is 1M Magnesium Chloride and is intended to extract the "Exchangeable and Adsorbed" metals.
Metals by CRC ICPMS (Tessier Extraction #2)	E450A Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by collision cell ICPMS. Note: For Extraction #2, the extraction solution is 1M Sodium Acetate adjusted to pH 5 and is intended to extract the "Carbonate" metals.
Metals by CRC ICPMS (Tessier Extraction #3)	E450B Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS.Note: For Extraction #3, the extraction solution is 0.1 M Hydroxylamine Hydro- Chloride in 25% v/v Acetic Acid and is intended to extract the □Easily Reducible Metals and Iron Oxides□.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #4)	E450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the \square Organic Bound \square metals.
Metals by CRC ICPMS (Tessier Extraction RM)	E450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
Mercury in Soil/Solid by CVAAS	E510 Calgary - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCI, followed by CVAAS analysis.
PAHs by Hex:Ace GC-MS	E641A Calgary - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.
Particle Size Analysis (Pipette) - Wentworth Classification	EC184A Saskatoon - Environmental	Soil/Solid	Modified Wentworth	The particle size determination is performed by various methods to generate a Grain Size curve. The data from the curve is then used to produce particle size ranges based on the Modified Wentworth Classification system.
Total Organic Carbon (Calculated) in soil (<63 µm)	EC356A Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC) analyzed on material passing a 63 µm sieve.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Calgary - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.

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Extraction of Metals for CRC ICPMS (Tessier - Environmental Parameters of Metals of Metals for CRC ICPMS (Tessier - Environmental Parameters of Metals of Metals for CRC ICPMS (Tessier - Environmental Parameters of Metals of Metals for CRC ICPMS (Tessier - Environmental Parameters of Metals of Metals of Metals for CRC ICPMS (Tessier - Environmental Parameters of Metals of Me	Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Extraction of Metals for CRC ICPMS (Tessier- Environmental EP450 Vancouver- Environmental EP450 Vancouver- Environmental EP450 Soll/Solid Tessier Extraction Procedure for the Speciation of Particulate Trace Metals* Analytical Chemistry, (A. Tessier, P.G.C. Campboll, and M. Bisson, June 1979). Initially, the sample is acquentable extracted with 5 or 6 (if a pre-liminary water extraction in included) different extraction Solutions. The extract is then centrifuged for 30 minutes and the supernatural subsequently removed and analysed. Instrumental analysis of the disputation of Particulate Trace Metals* Analytical Chemistry, (A. Tessier, P.G.C. Campboll, and M. Bisson, June 1979). Initially, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction in included) different extraction Solutions. The extract is then centrifuged for 30 minutes and the supernatural subsequently removed and analysed. Instrumental analysis of the extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental Extraction of Metals for CRC ICPMS (Tessier- Environmental) Extraction of Metals for CRC ICPMS (Tessier- Environmental) Extraction of Metals for CRC ICPMS (Tessier- Environmental) Extraction of Metals for CRC ICPMS (Tessier- Environmenta	Digestion for Metals and Mercury		Soil/Solid	EPA 200.2 (mod)	
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					the □Easily Reducible Metals and Iron Oxides□.

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Client : Teck Coal Limited



Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Extraction of Metals for CRC ICPMS (Tessier - OB)	EP450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the \square Organic Bound \square metals.
Extraction of Metals for CRC ICPMS (Tessier - RM)	EP450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Calgary - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind in Soil/Solid <60°C	EPP442 Calgary - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

ALS Canada Ltd.



QUALITY CONTROL REPORT

Work Order : CG2213407 Page : 1 of 25

 Client
 : Teck Coal Limited
 Laboratory
 : Calgary - Environmental

 Contact
 : Giovanna Diaz
 Account Manager
 : Lyudmyla Shvets

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Telephone : Telephone :+1 403 407 1800
Project :REGIONAL EFFECTS PROGRAM Date Samples Received :27-Sep-2022 14:00

C-O-C number : REP_LAEMP_GC_2022-09_ALS Issue Date
Sampler : Jennifer Ings___

Site · ----

Quote number : Teck Coal Master Quote

No. of samples received : 6
No. of samples analysed : 6

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

This Quality Control Report Contains the following information.

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

Address

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Saskatoon Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Saskatoon Sask Soils, Saskatoon, Saskatchewan	
Kelsey Schaefer	Lab Analyst	Calgary Organics, Calgary, Alberta	
Kevin Baxter		Calgary Metals, Calgary, Alberta	
Robin Weeks	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia	
Sorina Motea	Laboratory Analyst	Calgary Organics, Calgary, Alberta	
Vishnu Patel		Calgary Inorganics, Calgary, Alberta	

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Project : REGIONAL EFFECTS PROGRAM



General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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 Teck Coal Limited

Project : REGIONAL EFFECTS PROGRAM



Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier	
Physical Tests (QC	Lot: 679063)											
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	moisture		E144	0.25	%	73.0	77.5	5.97%	20%		
Physical Tests (QC	Lot: 681792)											
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	pH (1:2 soil:water)		E108	0.10	pH units	7.80	7.87	0.893%	5%		
Organic / Inorganic	Carbon (QC Lot: 68656	5)										
CG2213407-002	RG_GHP_SE-2_LAEMP_G C_2022-09-19_N	carbon, total [TC], <63µm		E351A	0.050	%	21.8	22.1	1.56%	20%		
Organic / Inorganic	Carbon (QC Lot: 691434	4)										
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	carbon, inorganic [IC], <63 μm		E354A	0.050	%	2.58	2.58	0.0867%	20%		
Metals (QC Lot: 68	0465)											
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	mercury	7439-97-6	E510	0.0050	mg/kg	0.0822	0.0842	2.29%	40%		
Metals (QC Lot: 68	0466)											
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	aluminum	7429-90-5	E440	50	mg/kg	7280	7670	5.11%	40%		
		antimony	7440-36-0	E440	0.10	mg/kg	1.23	1.30	5.78%	30%		
		arsenic	7440-38-2	E440	0.10	mg/kg	4.94	5.26	6.25%	30%		
		barium	7440-39-3	E440	0.50	mg/kg	400	400	0.0294%	40%		
		beryllium	7440-41-7	E440	0.10	mg/kg	0.63	0.63	0.0003	Diff <2x LOR		
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR		
		boron	7440-42-8	E440	5.0	mg/kg	5.7	6.7	1.0	Diff <2x LOR		
		cadmium	7440-43-9	E440	0.020	mg/kg	1.46	1.50	3.27%	30%		
		calcium	7440-70-2	E440	50	mg/kg	104000	116000	10.6%	30%		
		chromium	7440-47-3	E440	0.50	mg/kg	11.4	11.9	4.25%	30%		
		cobalt	7440-48-4	E440	0.10	mg/kg	8.92	9.33	4.50%	30%		
		copper	7440-50-8	E440	0.50	mg/kg	22.2	23.2	4.32%	30%		
		iron	7439-89-6	E440	50	mg/kg	11500	12500	8.29%	30%		
		lead	7439-92-1	E440	0.50	mg/kg	10.7	11.9	10.8%	40%		
		lithium	7439-93-2	E440	2.0	mg/kg	7.2	8.3	1.1	Diff <2x LOR		
		magnesium	7439-95-4	E440	20	mg/kg	5900	6120	3.74%	30%		
		manganese	7439-96-5	E440	1.0	mg/kg	216	223	2.92%	30%		
		molybdenum	7439-98-7	E440	0.10	mg/kg	1.54	1.74	12.0%	40%		

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ub-Matrix: Soil/Solid							Labora	tory Duplicate (D	UP) Report		
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
letals (QC Lot: 68	0466) - continued										
CG2213407-001	RG_GHP_SE-1_LAEMP_G C_2022-09-20_N	nickel	7440-02-0	E440	0.50	mg/kg	64.5	66.6	3.17%	30%	
		phosphorus	7723-14-0	E440	50	mg/kg	847	969	13.3%	30%	
		potassium	7440-09-7	E440	100	mg/kg	1730	1810	4.51%	40%	
		selenium	7782-49-2	E440	0.20	mg/kg	80.9	89.0	9.53%	30%	
		silver	7440-22-4	E440	0.10	mg/kg	0.35	0.40	0.05	Diff <2x LOR	
		sodium	7440-23-5	E440	50	mg/kg	81	84	3	Diff <2x LOR	
		strontium	7440-24-6	E440	0.50	mg/kg	83.7	92.2	9.64%	40%	
		sulfur	7704-34-9	E440	1000	mg/kg	6600	7200	8.06%	30%	
		thallium	7440-28-0	E440	0.050	mg/kg	0.181	0.185	0.004	Diff <2x LOR	
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium	7440-32-6	E440	1.0	mg/kg	9.0	10.6	15.4%	40%	
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		uranium	7440-61-1	E440	0.050	mg/kg	2.87	3.22	11.4%	30%	
		vanadium	7440-62-2	E440	0.20	mg/kg	26.6	28.5	6.57%	30%	
		zinc	7440-66-6	E440	2.0	mg/kg	128	133	3.92%	30%	
		zirconium	7440-67-7	E440	1.0	mg/kg	1.8	1.6	0.2	Diff <2x LOR	
olycyclic Aromati	c Hydrocarbons (QC Lot	·· 679062\									
G2213407-001	RG_GHP_SE-1_LAEMP_G	acenaphthene	83-32-9	E641A	0.050	mg/kg	0.540	0.480	11.7%	50%	
	C_2022-09-20_N	acenaphthylene	208-96-8	E641A	0.050	mg/kg	0.078	0.068	0.010	Diff <2x LOR	
		acridine	260-94-6	E641A	0.050	mg/kg	0.929	0.836	10.6%	50%	
		anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	0.354	0.316	11.2%	50%	
		benz(a)anthracene benzo(a)pyrene	56-55-3 50-32-8	E641A E641A	0.050 0.050	mg/kg mg/kg	0.354 0.232	0.316 0.181	11.2% 24.5%	50% 50%	
		benzo(a)pyrene				mg/kg					
		benzo(a)pyrene benzo(b+j)fluoranthene	50-32-8 n/a	E641A E641A	0.050	mg/kg mg/kg	0.232 0.857	0.181	24.5% 14.5%	50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene	50-32-8 n/a 191-24-2	E641A E641A E641A	0.050 0.050 0.050	mg/kg mg/kg mg/kg	0.232 0.857 0.257	0.181 0.741 0.229	24.5% 14.5% 11.6%	50% 50% 50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene	50-32-8 n/a 191-24-2 207-08-9	E641A E641A E641A	0.050 0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257 0.082	0.181 0.741 0.229 0.094	24.5% 14.5% 11.6% 0.013	50% 50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene chrysene	50-32-8 n/a 191-24-2	E641A E641A E641A	0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257	0.181 0.741 0.229	24.5% 14.5% 11.6%	50% 50% 50% Diff <2x LOR	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene chrysene dibenz(a,h)anthracene	50-32-8 n/a 191-24-2 207-08-9 218-01-9	E641A E641A E641A E641A	0.050 0.050 0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257 0.082 1.85	0.181 0.741 0.229 0.094 1.59	24.5% 14.5% 11.6% 0.013 15.1%	50% 50% 50% Diff <2x LOR 50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene chrysene dibenz(a,h)anthracene fluoranthene	50-32-8 n/a 191-24-2 207-08-9 218-01-9 53-70-3 206-44-0	E641A E641A E641A E641A E641A E641A	0.050 0.050 0.050 0.050 0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257 0.082 1.85 0.157 0.298	0.181 0.741 0.229 0.094 1.59 0.138 0.216	24.5% 14.5% 11.6% 0.013 15.1% 0.018 31.8%	50% 50% 50% Diff <2x LOR 50% Diff <2x LOR 50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene chrysene dibenz(a,h)anthracene fluoranthene fluorene	50-32-8 n/a 191-24-2 207-08-9 218-01-9 53-70-3 206-44-0 86-73-7	E641A E641A E641A E641A E641A E641A E641A	0.050 0.050 0.050 0.050 0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257 0.082 1.85 0.157 0.298 1.36	0.181 0.741 0.229 0.094 1.59 0.138 0.216 1.21	24.5% 14.5% 11.6% 0.013 15.1% 0.018 31.8% 11.9%	50% 50% 50% Diff <2x LOR 50% Diff <2x LOR 50% 50%	
		benzo(a)pyrene benzo(b+j)fluoranthene benzo(g,h,i)perylene benzo(k)fluoranthene chrysene dibenz(a,h)anthracene fluoranthene	50-32-8 n/a 191-24-2 207-08-9 218-01-9 53-70-3 206-44-0	E641A E641A E641A E641A E641A E641A	0.050 0.050 0.050 0.050 0.050 0.050 0.050	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.232 0.857 0.257 0.082 1.85 0.157 0.298	0.181 0.741 0.229 0.094 1.59 0.138 0.216	24.5% 14.5% 11.6% 0.013 15.1% 0.018 31.8%	50% 50% 50% Diff <2x LOR 50% Diff <2x LOR 50%	

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 Teck Coal Limited



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Polycyclic Aromati	c Hydrocarbons (QC Lot	:: 679062) - continued									
CG2213407-001	RG_GHP_SE-1_LAEMP_G C 2022-09-20 N	naphthalene	91-20-3	E641A	0.010	mg/kg	4.09	3.56	13.7%	50%	
	0_2022 00 201	phenanthrene	85-01-8	E641A	0.050	mg/kg	5.25	4.70	11.0%	50%	
		pyrene	129-00-0	E641A	0.050	mg/kg	0.540	0.525	2.79%	50%	
		quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
Exchangeable & Ac	dsorbed Metals (QC Lot:	695314)									
CG2213623-001	Anonymous	aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450	0.50	mg/kg	44.2	41.7	5.62%	30%	
		beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.152	0.146	0.006	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450	50	mg/kg	3750	3710	0.948%	30%	
		chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.17	0.17	0.004	Diff <2x LOR	
		copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450	1.0	mg/kg	36.1	32.8	9.48%	30%	
		molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		potassium, leachable	7440-09-7	E450	100	mg/kg	140	110	20	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450	0.50	mg/kg	12.9	12.9	0.0825%	30%	
		thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	

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ub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
aboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
arbonate Metals (QC Lot: 697168)										
G2213623-001	Anonymous	aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.054	0.056	0.002	Diff <2x LOR	
		barium, leachable	7440-39-3	E450A	2.0	mg/kg	35.7	34.9	2.34%	30%	
		beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.166	0.169	0.004	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450A	50	mg/kg	2760	2920	5.83%	30%	
		chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	0.70	0.64	8.88%	30%	
		copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450A	5.0	mg/kg	101	100	0.987%	30%	
		molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450A	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450A	5.0	mg/kg	5.4	5.7	0.4	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450A	0.050	mg/kg	<0.050	0.051	0.0009	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		zinc, leachable	7440-66-6	E450A	1.0	mg/kg	5.0	5.2	0.2	Diff <2x LOR	
asilv Reducible M	etals and Iron Oxides	(QC Lot: 697833)									
G2213623-001	Anonymous	aluminum, leachable	7429-90-5	E450B	50	mg/kg	595	596	0.176%	30%	
		antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.516	0.603	15.5%	30%	
		barium, leachable	7440-39-3	E450B	0.50	mg/kg	51.3	50.5	1.49%	30%	
		beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.30	0.27	0.03	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	

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Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Easily Reducible M	etals and Iron Oxides(QC Lot: 697833) - continued									
CG2213623-001	Anonymous	cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.385	0.411	6.54%	30%	
		calcium, leachable	7440-70-2	E450B	50	mg/kg	3020	3320	9.62%	30%	
		chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.80	0.83	0.03	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	4.46	4.21	5.73%	30%	
		copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.69	0.64	0.05	Diff <2x LOR	
		iron, leachable	7439-89-6	E450B	50	mg/kg	3810	3570	6.46%	30%	
		lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.26	3.19	0.07	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450B	1.0	mg/kg	218	193	11.9%	30%	
		molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450B	0.50	mg/kg	11.3	11.2	0.818%	30%	
		phosphorus, leachable	7723-14-0	E450B	50	mg/kg	183	147	35	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450B	0.10	mg/kg	0.10	<0.10	0.006	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450B	0.50	mg/kg	6.18	6.58	6.24%	30%	
		thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.161	0.176	0.015	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.78	2.76	0.736%	30%	
		zinc, leachable	7440-66-6	E450B	1.0	mg/kg	26.5	27.9	5.24%	30%	
Organic Bound Met	als (QC Lot: 702272)										
CG2213623-001	Anonymous	aluminum, leachable	7429-90-5	E450C	50	mg/kg	1850	1790	3.64%	30%	
		antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.408	0.463	12.6%	30%	
		barium, leachable	7440-39-3	E450C	0.50	mg/kg	25.3	22.8	10.4%	30%	
		beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.080	0.082	0.002	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450C	50	mg/kg	1040	1030	1.28%	30%	
		chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.66	3.62	0.996%	30%	
		cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.10	1.01	8.37%	30%	
		copper, leachable	7440-50-8	E450C	0.50	mg/kg	6.38	6.65	4.16%	30%	
		iron, leachable	7439-89-6	E450C	50	mg/kg	1890	1910	1.12%	30%	

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Sub-Matrix: Soil/Solid						Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Organic Bound Met	tals (QC Lot: 702272)	- continued									
CG2213623-001 Anonymous	Anonymous	lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.80	0.88	0.08	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450C	1.0	mg/kg	19.9	16.8	16.9%	30%	
		molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450C	0.50	mg/kg	6.08	6.11	0.543%	30%	
		selenium, leachable	7782-49-2	E450C	0.20	mg/kg	0.90	0.94	0.04	Diff <2x LOR	
		silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.75	4.63	2.63%	30%	
		thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450C	1.0	mg/kg	1.7	2.1	0.4	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.255	0.271	0.017	Diff <2x LOR	
	vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.26	4.46	4.63%	30%		
	zinc, leachable	7440-66-6	E450C	1.0	mg/kg	8.9	8.9	0.125%	30%		
Residual Metals (Q	C Lot: 704532)										
CG2213623-001 Anonymous	Anonymous	aluminum, leachable	7429-90-5	E450D	50	mg/kg	8080	7600	6.07%	30%	
		antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.70	0.77	9.57%	30%	
		arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	<5.00	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450D	2.0	mg/kg	120	131	8.45%	30%	
		beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.38	0.37	0.008	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.074	0.081	0.008	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450D	50	mg/kg	678	592	13.6%	30%	
		chromium, leachable	7440-47-3	E450D	5.0	mg/kg	11.4	10.8	0.6	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.85	2.75	3.73%	30%	
		copper, leachable	7440-50-8	E450D	0.50	mg/kg	12.3	12.1	2.08%	30%	
		iron, leachable	7439-89-6	E450D	50	mg/kg	11600	10200	13.0%	30%	
		lead, leachable	7439-92-1	E450D	0.50	mg/kg	7.04	7.14	1.38%	30%	
		lithium, leachable	7439-93-2	E450D	5.0	mg/kg	7.0	6.4	0.5	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450D	5.0	mg/kg	43.4	40.0	8.05%	30%	
		molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.96	0.98	0.02	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450D	2.0	mg/kg	11.4	10.8	0.6	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.46	0.40	0.06	Diff <2x LOR	
		silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.12	0.15	0.03	Diff <2x LOR	

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Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Residual Metals (Q	Residual Metals (QC Lot: 704532) - continued										
CG2213623-001	Anonymous	strontium, leachable	7440-24-6	E450D	5.0	mg/kg	19.1	21.8	2.7	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.137	0.159	0.022	Diff <2x LOR	
		tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450D	5.0	mg/kg	16.8	22.1	5.3	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.346	0.366	5.52%	30%	
		vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	28.9	27.3	5.76%	30%	
		zinc, leachable	7440-66-6	E450D	1.0	mg/kg	62.7	60.7	3.31%	30%	

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Method Blank (MB) Report

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

Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 679063)						
moisture		E144	0.25	%	<0.25	
Organic / Inorganic Carbon (QCLot: 0						
carbon, total [TC], <63μm		E351A	0.05	%	<0.050	
Organic / Inorganic Carbon (QCLot: (
carbon, inorganic [IC], <63 μm		E354A	0.05	%	<0.050	
Metals (QCLot: 680465)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	
Metals (QCLot: 680466)						
aluminum	7429-90-5	E440	50	mg/kg	<50	
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	
barium	7440-39-3	E440	0.5	mg/kg	<0.50	
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	
boron	7440-42-8	E440	5	mg/kg	<5.0	
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	
calcium	7440-70-2	E440	50	mg/kg	<50	
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	
copper	7440-50-8	E440	0.5	mg/kg	<0.50	
iron	7439-89-6	E440	50	mg/kg	<50	
lead	7439-92-1	E440	0.5	mg/kg	<0.50	
lithium	7439-93-2	E440	2	mg/kg	<2.0	
magnesium	7439-95-4	E440	20	mg/kg	<20	
manganese	7439-96-5	E440	1	mg/kg	<1.0	
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	
phosphorus	7723-14-0	E440	50	mg/kg	<50	
potassium	7440-09-7	E440	100	mg/kg	<100	
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	
silver	7440-22-4	E440	0.1	mg/kg	<0.10	
sodium	7440-23-5		50	mg/kg	<50	

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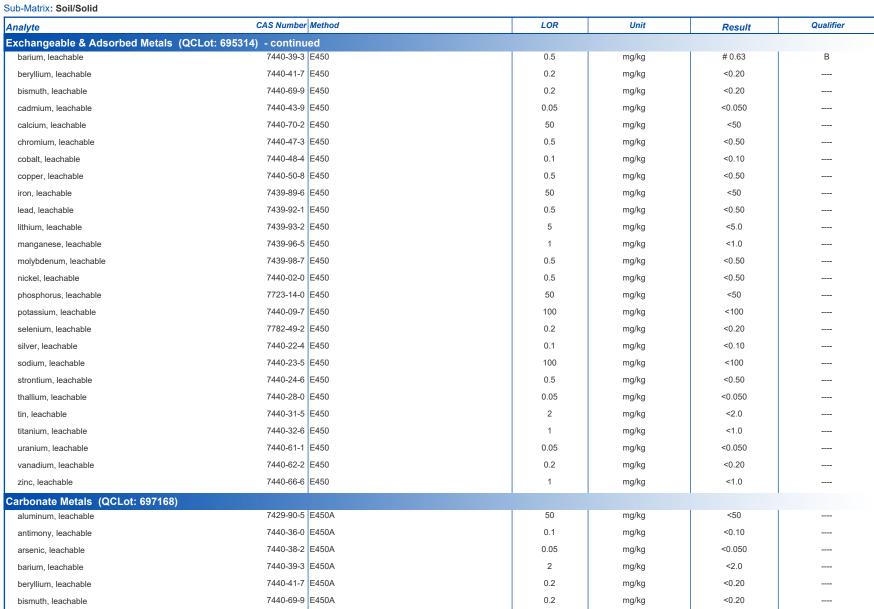
nalyte	CAS Number	Method	LOR	Unit	Result	Qualifier
letals (QCLot: 680466) - continue	d					
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	
sulfur	7704-34-9	E440	1000	mg/kg	<1000	
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	
tin	7440-31-5	E440	2	mg/kg	<2.0	
titanium	7440-32-6	E440	1	mg/kg	<1.0	
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	
zinc	7440-66-6	E440	2	mg/kg	<2.0	
zirconium	7440-67-7	E440	1	mg/kg	<1.0	
olycyclic Aromatic Hydrocarbons	(QCLot: 679062)					
acenaphthene	83-32-9	E641A	0.05	mg/kg	<0.050	
acenaphthylene	208-96-8	E641A	0.05	mg/kg	<0.050	
acridine	260-94-6	E641A	0.05	mg/kg	<0.050	
anthracene	120-12-7	E641A	0.05	mg/kg	<0.050	
benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	<0.050	
benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	<0.050	
benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	<0.050	
benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	<0.050	
benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	<0.050	
chrysene	218-01-9	E641A	0.05	mg/kg	<0.050	
dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	<0.050	
fluoranthene	206-44-0	E641A	0.05	mg/kg	<0.050	
fluorene	86-73-7	E641A	0.05	mg/kg	<0.050	
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	<0.050	
methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	<0.030	
methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	<0.030	
naphthalene	91-20-3	E641A	0.01	mg/kg	<0.010	
phenanthrene	85-01-8	E641A	0.05	mg/kg	<0.050	
pyrene	129-00-0	E641A	0.05	mg/kg	<0.050	
quinoline	91-22-5	E641A	0.05	mg/kg	<0.050	
changeable & Adsorbed Metals	(QCLot: 695314)					
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450	0.05	mg/kg	<0.050	

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cadmium, leachable

calcium, leachable



0.05

50

mg/kg

mg/kg

<0.050

<50

7440-43-9 E450A

7440-70-2 E450A



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nalyte	CAS Number Method	LOR	Unit	Result	Qualifier
arbonate Metals (QCLot: 697168)	- continued				
chromium, leachable	7440-47-3 E450A	5	mg/kg	<5.0	
cobalt, leachable	7440-48-4 E450A	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8 E450A	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6 E450A	50	mg/kg	<50	
lead, leachable	7439-92-1 E450A	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2 E450A	5	mg/kg	<5.0	
manganese, leachable	7439-96-5 E450A	5	mg/kg	<5.0	
molybdenum, leachable	7439-98-7 E450A	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0 E450A	2	mg/kg	<2.0	
phosphorus, leachable	7723-14-0 E450A	50	mg/kg	<50	
selenium, leachable	7782-49-2 E450A	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4 E450A	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6 E450A	5	mg/kg	<5.0	
thallium, leachable	7440-28-0 E450A	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5 E450A	2	mg/kg	<2.0	
titanium, leachable	7440-32-6 E450A	5	mg/kg	<5.0	
uranium, leachable	7440-61-1 E450A	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2 E450A	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6 E450A	1	mg/kg	<1.0	
asily Reducible Metals and Iron O	xides (QCLot: 697833)				
aluminum, leachable	7429-90-5 E450B	50	mg/kg	<50	
antimony, leachable	7440-36-0 E450B	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2 E450B	0.05	mg/kg	<0.050	
barium, leachable	7440-39-3 E450B	0.5	mg/kg	<0.50	
beryllium, leachable	7440-41-7 E450B	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9 E450B	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9 E450B	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2 E450B	50	mg/kg	<50	
chromium, leachable	7440-47-3 E450B	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4 E450B	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8 E450B	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6 E450B	50	mg/kg	<50	
lead, leachable	7439-92-1 E450B	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2 E450B	5	mg/kg	<5.0	
manganese, leachable	7439-96-5 E450B	1	mg/kg	<1.0	

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 :
 Teck Coal Lir

Project : REGIONAL EFFECTS PROGRAM



Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	? Unit	Result	Qualifier
Easily Reducible Metals and Iron (Oxides (QCLot: 697833) - c	ontinued				
molybdenum, leachable	7439-98-7	E450B	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450B	0.5	mg/kg	<0.50	
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	<50	
selenium, leachable	7782-49-2	E450B	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450B	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450B	0.5	mg/kg	<0.50	
thallium, leachable	7440-28-0	E450B	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450B	2	mg/kg	<2.0	
titanium, leachable	7440-32-6	E450B	1	mg/kg	<1.0	
uranium, leachable	7440-61-1	E450B	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450B	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450B	1	mg/kg	<1.0	
Organic Bound Metals (QCLot: 70	2272)					•
aluminum, leachable	7429-90-5	E450C	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450C	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450C	0.05	mg/kg	<0.050	
barium, leachable	7440-39-3	E450C	0.5	mg/kg	<0.50	
beryllium, leachable	7440-41-7	E450C	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9	E450C	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450C	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450C	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450C	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4	E450C	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450C	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450C	50	mg/kg	<50	
lead, leachable	7439-92-1	E450C	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450C	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450C	1	mg/kg	<1.0	
molybdenum, leachable	7439-98-7	E450C	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450C	0.5	mg/kg	<0.50	
selenium, leachable	7782-49-2	E450C	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450C	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450C	0.5	mg/kg	<0.50	
thallium, leachable	7440-28-0	E450C	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450C	2	mg/kg	<2.0	



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Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Organic Bound Metals (QCLot: 70	02272) - continued					
titanium, leachable	7440-32-6	E450C	1	mg/kg	<1.0	
uranium, leachable	7440-61-1	E450C	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450C	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450C	1	mg/kg	<1.0	
Residual Metals (QCLot: 704532)						
aluminum, leachable	7429-90-5	E450D	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450D	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450D	0.5	mg/kg	<0.50	
barium, leachable	7440-39-3	E450D	2	mg/kg	<2.0	
beryllium, leachable	7440-41-7	E450D	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9	E450D	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450D	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450D	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450D	5	mg/kg	<5.0	
cobalt, leachable	7440-48-4	E450D	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450D	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450D	50	mg/kg	<50	
lead, leachable	7439-92-1	E450D	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450D	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450D	5	mg/kg	<5.0	
molybdenum, leachable	7439-98-7	E450D	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450D	2	mg/kg	<2.0	
selenium, leachable	7782-49-2	E450D	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450D	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450D	5	mg/kg	<5.0	
thallium, leachable	7440-28-0	E450D	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450D	2	mg/kg	<2.0	
titanium, leachable	7440-32-6	E450D	5	mg/kg	<5.0	
uranium, leachable	7440-61-1	E450D	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450D	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450D	1	mg/kg	<1.0	

Qualifiers

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Qualifier Description

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REGIONAL EFFECTS PROGRAM Project

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Soil/Solid	Sub-Matrix: Soil/Solid				Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 679063)									
moisture		E144	0.25	%	50 %	95.4	90.0	110	
Physical Tests (QCLot: 681792)									
pH (1:2 soil:water)		E108		pH units	7 pH units	101	97.0	103	
Organic / Inorganic Carbon (QCLot: 686565)									
carbon, total [TC], <63µm		E351A	0.05	%	48 %	99.2	90.0	110	
Organic / Inorganic Carbon (QCLot: 691434)									
carbon, inorganic [IC], <63 μm		E354A	0.05	%	0.5 %	93.4	80.0	120	
Metals (QCLot: 680465)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	97.1	80.0	120	
Metals (QCLot: 680466)									
aluminum	7429-90-5		50	mg/kg	200 mg/kg	97.4	80.0	120	
antimony	7440-36-0		0.1	mg/kg	100 mg/kg	101	80.0	120	
arsenic	7440-38-2		0.1	mg/kg	100 mg/kg	99.0	80.0	120	
barium	7440-39-3		0.5	mg/kg	25 mg/kg	97.3	80.0	120	
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	96.3	80.0	120	
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	94.7	80.0	120	
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	93.6	80.0	120	
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	96.6	80.0	120	
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	100	80.0	120	
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	98.2	80.0	120	
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	99.1	80.0	120	
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	96.9	80.0	120	
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	94.5	80.0	120	
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	98.4	80.0	120	
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	91.2	80.0	120	
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	98.0	80.0	120	
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	100	80.0	120	
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	97.2	80.0	120	
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	97.6	80.0	120	
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	98.4	80.0	120	
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	98.1	80.0	120	

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Sub-Matrix: Soil/Solid		Laboratory Control Sample (LCS) Report							
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 680466) - continued									
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	99.6	80.0	120	
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	97.9	80.0	120	
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	101	80.0	120	
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	98.6	80.0	120	
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	103	80.0	120	
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	96.2	80.0	120	
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	96.9	80.0	120	
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	103	80.0	120	
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	96.6	80.0	120	
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	94.1	80.0	120	
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	100	80.0	120	
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	95.2	80.0	120	
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	96.6	80.0	120	
Polycyclic Aromatic Hydrocarbons (QC	Lot: 679062)								•
acenaphthene	83-32-9	E641A	0.05	mg/kg	0.5 mg/kg	84.6	60.0	130	
acenaphthylene	208-96-8	E641A	0.05	mg/kg	0.5 mg/kg	92.2	60.0	130	
acridine	260-94-6	E641A	0.05	mg/kg	0.5 mg/kg	84.7	60.0	130	
anthracene	120-12-7	E641A	0.05	mg/kg	0.5 mg/kg	86.0	60.0	130	
benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	0.5 mg/kg	87.8	60.0	130	
benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	0.5 mg/kg	93.6	60.0	130	
benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	0.5 mg/kg	92.4	60.0	130	
benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	0.5 mg/kg	84.2	60.0	130	
benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	0.5 mg/kg	92.9	60.0	130	
chrysene	218-01-9	E641A	0.05	mg/kg	0.5 mg/kg	86.0	60.0	130	
dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	0.5 mg/kg	90.0	60.0	130	
fluoranthene	206-44-0	E641A	0.05	mg/kg	0.5 mg/kg	93.0	60.0	130	
fluorene	86-73-7	E641A	0.05	mg/kg	0.5 mg/kg	88.5	60.0	130	
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	0.5 mg/kg	98.8	60.0	130	
methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	0.5 mg/kg	89.6	60.0	130	
methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	0.5 mg/kg	86.7	60.0	130	
naphthalene	91-20-3	E641A	0.01	mg/kg	0.5 mg/kg	86.3	50.0	130	
, phenanthrene	85-01-8	E641A	0.05	mg/kg	0.5 mg/kg	89.8	60.0	130	
pyrene	129-00-0	E641A	0.05	mg/kg	0.5 mg/kg	92.0	60.0	130	
quinoline	91-22-5		0.05	mg/kg	0.5 mg/kg	84.8	60.0	130	
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Sub-Matrix: Soil/Solid					Laboratory Co	ntrol Sample (LCS)	Report	
				Spike	Recovery (%)	Recovery	Limits (%)	
Analyte CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Exchangeable & Adsorbed Metals (QCLot: 695314)								
aluminum, leachable 7429-90-5	E450	50	mg/kg	2 mg/kg	104	70.0	130	
antimony, leachable 7440-36-0	E450	0.1	mg/kg	0.2 mg/kg	97.5	70.0	130	
arsenic, leachable 7440-38-2	E450	0.05	mg/kg	0.2 mg/kg	96.4	70.0	130	
barium, leachable 7440-39-3	E450	0.5	mg/kg	0.2 mg/kg	94.0	70.0	130	
beryllium, leachable 7440-41-7	E450	0.2	mg/kg	0.4 mg/kg	99.9	70.0	130	
bismuth, leachable 7440-69-9	E450	0.2	mg/kg	0.1 mg/kg	83.0	70.0	130	
cadmium, leachable 7440-43-9	E450	0.05	mg/kg	0.04 mg/kg	99.5	70.0	130	
calcium, leachable 7440-70-2	E450	50	mg/kg	40 mg/kg	99.5	70.0	130	
chromium, leachable 7440-47-3	E450	0.5	mg/kg	0.4 mg/kg	98.3	70.0	130	
cobalt, leachable 7440-48-4	E450	0.1	mg/kg	0.2 mg/kg	95.6	70.0	130	
copper, leachable 7440-50-8	E450	0.5	mg/kg	0.2 mg/kg	92.4	70.0	130	
iron, leachable 7439-89-6	E450	50	mg/kg	20 mg/kg	98.1	70.0	130	
lead, leachable 7439-92-1	E450	0.5	mg/kg	0.2 mg/kg	87.5	70.0	130	
lithium, leachable 7439-93-2	E450	5	mg/kg	1 mg/kg	100	70.0	130	
manganese, leachable 7439-96-5	E450	1	mg/kg	0.2 mg/kg	103	70.0	130	
molybdenum, leachable 7439-98-7	E450	0.5	mg/kg	0.2 mg/kg	101	70.0	130	
nickel, leachable 7440-02-0	E450	0.5	mg/kg	0.4 mg/kg	92.8	70.0	130	
phosphorus, leachable 7723-14-0	E450	50	mg/kg	100 mg/kg	111	70.0	130	
potassium, leachable 7440-09-7	E450	100	mg/kg	40 mg/kg	98.5	70.0	130	
selenium, leachable 7782-49-2	E450	0.2	mg/kg	0.4 mg/kg	98.6	70.0	130	
silver, leachable 7440-22-4	E450	0.1	mg/kg	0.04 mg/kg	102	70.0	130	
sodium, leachable 7440-23-5	E450	100	mg/kg	20 mg/kg	103	70.0	130	
strontium, leachable 7440-24-6	E450	0.5	mg/kg	0.2 mg/kg	102	70.0	130	
thallium, leachable 7440-28-0	E450	0.05	mg/kg	0.04 mg/kg	88.0	70.0	130	
tin, leachable 7440-31-5	E450	2	mg/kg	0.2 mg/kg	96.0	70.0	130	
titanium, leachable 7440-32-6	E450	1	mg/kg	0.4 mg/kg	97.7	70.0	130	
uranium, leachable 7440-61-1	E450	0.05	mg/kg	0.04 mg/kg	86.8	70.0	130	
vanadium, leachable 7440-62-2	E450	0.2	mg/kg	1 mg/kg	101	70.0	130	
zinc, leachable 7440-66-6	E450	1	mg/kg	4 mg/kg	97.3	70.0	130	
Carbonate Metals (QCLot: 697168)								
aluminum, leachable 7429-90-5	E450A	50	mg/kg	2 mg/kg	105	70.0	130	
antimony, leachable 7440-36-0	E450A	0.1	mg/kg	0.2 mg/kg	100	70.0	130	
arsenic, leachable 7440-38-2	E450A	0.05	mg/kg	0.2 mg/kg	104	70.0	130	
barium, leachable 7440-39-3	E450A	2	mg/kg	0.2 mg/kg	102	70.0	130	
beryllium, leachable 7440-41-7	E450A	0.2	mg/kg	0.4 mg/kg	100	70.0	130	

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Sub-Matrix: Soil/Solid					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Carbonate Metals (QCLot: 697168) - c	ontinued								
bismuth, leachable	7440-69-9	E450A	0.2	mg/kg	0.1 mg/kg	86.0	70.0	130	
cadmium, leachable	7440-43-9	E450A	0.05	mg/kg	0.04 mg/kg	102	70.0	130	
calcium, leachable	7440-70-2	E450A	50	mg/kg	40 mg/kg	97.6	70.0	130	
chromium, leachable	7440-47-3	E450A	5	mg/kg	0.4 mg/kg	100	70.0	130	
cobalt, leachable	7440-48-4	E450A	0.1	mg/kg	0.2 mg/kg	100	70.0	130	
copper, leachable	7440-50-8	E450A	0.5	mg/kg	0.2 mg/kg	98.1	70.0	130	
iron, leachable	7439-89-6	E450A	50	mg/kg	20 mg/kg	97.0	70.0	130	
lead, leachable	7439-92-1	E450A	0.5	mg/kg	0.2 mg/kg	91.5	70.0	130	
lithium, leachable	7439-93-2	E450A	5	mg/kg	1 mg/kg	103	70.0	130	
manganese, leachable	7439-96-5	E450A	5	mg/kg	0.2 mg/kg	104	70.0	130	
molybdenum, leachable	7439-98-7	E450A	0.5	mg/kg	0.2 mg/kg	104	70.0	130	
nickel, leachable	7440-02-0	E450A	2	mg/kg	0.4 mg/kg	98.2	70.0	130	
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	100 mg/kg	103	70.0	130	
selenium, leachable	7782-49-2	E450A	0.2	mg/kg	0.4 mg/kg	99.3	70.0	130	
silver, leachable	7440-22-4	E450A	0.1	mg/kg	0.04 mg/kg	102	70.0	130	
strontium, leachable	7440-24-6	E450A	5	mg/kg	0.2 mg/kg	105	70.0	130	
thallium, leachable	7440-28-0	E450A	0.05	mg/kg	0.04 mg/kg	91.9	70.0	130	
tin, leachable	7440-31-5	E450A	2	mg/kg	0.2 mg/kg	100	70.0	130	
titanium, leachable	7440-32-6	E450A	5	mg/kg	0.4 mg/kg	100	70.0	130	
uranium, leachable	7440-61-1	E450A	0.05	mg/kg	0.04 mg/kg	91.7	70.0	130	
vanadium, leachable	7440-62-2	E450A	0.2	mg/kg	1 mg/kg	104	70.0	130	
zinc, leachable	7440-66-6	E450A	1	mg/kg	4 mg/kg	102	70.0	130	
Easily Reducible Metals and Iron Oxid	les (QCLot: 697833)								
aluminum, leachable	7429-90-5	E450B	50	mg/kg	2 mg/kg	99.9	70.0	130	
antimony, leachable	7440-36-0	E450B	0.1	mg/kg	0.2 mg/kg	100	70.0	130	
arsenic, leachable	7440-38-2	E450B	0.05	mg/kg	0.2 mg/kg	106	70.0	130	
barium, leachable	7440-39-3	E450B	0.5	mg/kg	0.2 mg/kg	97.9	70.0	130	
beryllium, leachable	7440-41-7	E450B	0.2	mg/kg	0.4 mg/kg	102	70.0	130	
bismuth, leachable	7440-69-9	E450B	0.2	mg/kg	0.1 mg/kg	91.0	70.0	130	
cadmium, leachable	7440-43-9	E450B	0.05	mg/kg	0.04 mg/kg	102	70.0	130	
calcium, leachable	7440-70-2	E450B	50	mg/kg	40 mg/kg	99.1	70.0	130	
chromium, leachable	7440-47-3	E450B	0.5	mg/kg	0.4 mg/kg	102	70.0	130	
cobalt, leachable	7440-48-4	E450B	0.1	mg/kg	0.2 mg/kg	104	70.0	130	
copper, leachable	7440-50-8	E450B	0.5	mg/kg	0.2 mg/kg	102	70.0	130	
iron, leachable	7439-89-6	E450B	50	mg/kg	20 mg/kg	101	70.0	130	

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Sub-Matrix: Soil/Solid				Laboratory Control Sample (LCS) Report					
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Easily Reducible Metals and Iron Oxid	les (QCLot: 697833) - cor	ntinued							
lead, leachable	7439-92-1		0.5	mg/kg	0.2 mg/kg	95.7	70.0	130	
lithium, leachable	7439-93-2	E450B	5	mg/kg	1 mg/kg	104	70.0	130	
manganese, leachable	7439-96-5	E450B	1	mg/kg	0.2 mg/kg	103	70.0	130	
molybdenum, leachable	7439-98-7	E450B	0.5	mg/kg	0.2 mg/kg	100	70.0	130	
nickel, leachable	7440-02-0	E450B	0.5	mg/kg	0.4 mg/kg	102	70.0	130	
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	100 mg/kg	99.7	70.0	130	
selenium, leachable	7782-49-2	E450B	0.2	mg/kg	0.4 mg/kg	118	70.0	130	
silver, leachable	7440-22-4	E450B	0.1	mg/kg	0.04 mg/kg	104	70.0	130	
strontium, leachable	7440-24-6	E450B	0.5	mg/kg	0.2 mg/kg	101	70.0	130	
thallium, leachable	7440-28-0	E450B	0.05	mg/kg	0.04 mg/kg	98.8	70.0	130	
tin, leachable	7440-31-5	E450B	2	mg/kg	0.2 mg/kg	99.5	70.0	130	
titanium, leachable	7440-32-6	E450B	1	mg/kg	0.4 mg/kg	96.7	70.0	130	
uranium, leachable	7440-61-1	E450B	0.05	mg/kg	0.04 mg/kg	95.0	70.0	130	
vanadium, leachable	7440-62-2	E450B	0.2	mg/kg	1 mg/kg	103	70.0	130	
zinc, leachable	7440-66-6	E450B	1	mg/kg	4 mg/kg	107	70.0	130	
Organic Bound Metals (QCLot: 702272	2)								
aluminum, leachable	7429-90-5	E450C	50	mg/kg	2 mg/kg	104	70.0	130	
antimony, leachable	7440-36-0	E450C	0.1	mg/kg	0.2 mg/kg	97.6	70.0	130	
arsenic, leachable	7440-38-2	E450C	0.05	mg/kg	0.2 mg/kg	108	70.0	130	
barium, leachable	7440-39-3	E450C	0.5	mg/kg	0.2 mg/kg	101	70.0	130	
beryllium, leachable	7440-41-7	E450C	0.2	mg/kg	0.4 mg/kg	95.0	70.0	130	
bismuth, leachable	7440-69-9	E450C	0.2	mg/kg	0.1 mg/kg	95.9	70.0	130	
cadmium, leachable	7440-43-9	E450C	0.05	mg/kg	0.04 mg/kg	102	70.0	130	
calcium, leachable	7440-70-2	E450C	50	mg/kg	40 mg/kg	93.0	70.0	130	
chromium, leachable	7440-47-3	E450C	0.5	mg/kg	0.4 mg/kg	100	70.0	130	
cobalt, leachable	7440-48-4	E450C	0.1	mg/kg	0.2 mg/kg	101	70.0	130	
copper, leachable	7440-50-8	E450C	0.5	mg/kg	0.2 mg/kg	102	70.0	130	
iron, leachable	7439-89-6	E450C	50	mg/kg	20 mg/kg	98.3	70.0	130	
lead, leachable	7439-92-1	E450C	0.5	mg/kg	0.2 mg/kg	98.2	70.0	130	
lithium, leachable	7439-93-2	E450C	5	mg/kg	1 mg/kg	94.9	70.0	130	
manganese, leachable	7439-96-5	E450C	1	mg/kg	0.2 mg/kg	100	70.0	130	
molybdenum, leachable	7439-98-7	E450C	0.5	mg/kg	0.2 mg/kg	98.2	70.0	130	
nickel, leachable	7440-02-0	E450C	0.5	mg/kg	0.4 mg/kg	101	70.0	130	
selenium, leachable	7782-49-2	E450C	0.2	mg/kg	0.4 mg/kg	106	70.0	130	
silver, leachable	7440-22-4		0.1	mg/kg			70.0	130	

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Sub-Matrix: Soil/Solid					Laboratory Control Sample (LCS) Report					
					Spike	Recovery (%)	Recovery	Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Organic Bound Metals (QCLot: 702272)	- continued									
strontium, leachable	7440-24-6	E450C	0.5	mg/kg	0.2 mg/kg	99.7	70.0	130		
thallium, leachable	7440-28-0	E450C	0.05	mg/kg	0.04 mg/kg	97.1	70.0	130		
tin, leachable	7440-31-5	E450C	2	mg/kg	0.2 mg/kg	97.0	70.0	130		
titanium, leachable	7440-32-6	E450C	1	mg/kg	0.4 mg/kg	99.4	70.0	130		
uranium, leachable	7440-61-1	E450C	0.05	mg/kg	0.04 mg/kg	97.1	70.0	130		
vanadium, leachable	7440-62-2	E450C	0.2	mg/kg	1 mg/kg	100	70.0	130		
zinc, leachable	7440-66-6	E450C	1	mg/kg	4 mg/kg	103	70.0	130		
Residual Metals (QCLot: 704532)										
aluminum, leachable	7429-90-5		50	mg/kg	2 mg/kg	98.3	70.0	130		
antimony, leachable	7440-36-0	E450D	0.1	mg/kg	0.2 mg/kg	103	70.0	130		
arsenic, leachable	7440-38-2	E450D	0.5	mg/kg	0.2 mg/kg	97.9	70.0	130		
barium, leachable	7440-39-3	E450D	2	mg/kg	0.2 mg/kg	97.5	70.0	130		
beryllium, leachable	7440-41-7	E450D	0.2	mg/kg	0.4 mg/kg	99.7	70.0	130		
bismuth, leachable	7440-69-9	E450D	0.2	mg/kg	0.1 mg/kg	97.1	70.0	130		
cadmium, leachable	7440-43-9	E450D	0.05	mg/kg	0.04 mg/kg	98.4	70.0	130		
calcium, leachable	7440-70-2	E450D	50	mg/kg	40 mg/kg	102	70.0	130		
chromium, leachable	7440-47-3	E450D	5	mg/kg	0.4 mg/kg	98.4	70.0	130		
cobalt, leachable	7440-48-4	E450D	0.1	mg/kg	0.2 mg/kg	99.3	70.0	130		
copper, leachable	7440-50-8	E450D	0.5	mg/kg	0.2 mg/kg	98.1	70.0	130		
iron, leachable	7439-89-6	E450D	50	mg/kg	20 mg/kg	99.6	70.0	130		
lead, leachable	7439-92-1	E450D	0.5	mg/kg	0.2 mg/kg	99.1	70.0	130		
lithium, leachable	7439-93-2	E450D	5	mg/kg	1 mg/kg	103	70.0	130		
manganese, leachable	7439-96-5	E450D	5	mg/kg	0.2 mg/kg	101	70.0	130		
molybdenum, leachable	7439-98-7	E450D	0.5	mg/kg	0.2 mg/kg	95.2	70.0	130		
nickel, leachable	7440-02-0	E450D	2	mg/kg	0.4 mg/kg	99.6	70.0	130		
selenium, leachable	7782-49-2	E450D	0.2	mg/kg	0.4 mg/kg	98.7	70.0	130		
silver, leachable	7440-22-4	E450D	0.1	mg/kg	0.04 mg/kg	102	70.0	130		
strontium, leachable	7440-24-6	E450D	5	mg/kg	0.2 mg/kg	98.6	70.0	130		
thallium, leachable	7440-28-0	E450D	0.05	mg/kg	0.04 mg/kg	101	70.0	130		
tin, leachable	7440-31-5	E450D	2	mg/kg	0.2 mg/kg	97.0	70.0	130		
titanium, leachable	7440-32-6	E450D	5	mg/kg	0.4 mg/kg	97.8	70.0	130		
uranium, leachable	7440-61-1	E450D	0.05	mg/kg	0.04 mg/kg	99.2	70.0	130		
vanadium, leachable	7440-62-2	E450D	0.2	mg/kg	1 mg/kg	99.7	70.0	130		
zinc, leachable	7440-66-6	E450D	1	mg/kg	4 mg/kg	101	70.0	130		

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Matrix Spike (MS) Report

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

Sub-Matrix: Soil/So	lid						Matrix Spik	re (MS) Report		
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	atic Hydrocarbons (QCL	ot: 679062)								
CG2213407-001	RG_GHP_SE-1_LAEMP_G	acenaphthene	83-32-9	E641A	0.313 mg/kg	0.5 mg/kg	83.1	50.0	140	
	C_2022-09-20_N	acenaphthylene	208-96-8	E641A	0.291 mg/kg	0.5 mg/kg	77.2	50.0	140	
		acridine	260-94-6	E641A	0.280 mg/kg	0.5 mg/kg	74.1	50.0	140	
		anthracene	120-12-7	E641A	0.321 mg/kg	0.5 mg/kg	85.1	50.0	140	
		benz(a)anthracene	56-55-3	E641A	0.330 mg/kg	0.5 mg/kg	87.6	50.0	140	
		benzo(a)pyrene	50-32-8	E641A	0.325 mg/kg	0.5 mg/kg	86.3	50.0	140	
		benzo(b+j)fluoranthene	n/a	E641A	0.343 mg/kg	0.5 mg/kg	91.1	50.0	140	
		benzo(g,h,i)perylene	191-24-2	E641A	0.296 mg/kg	0.5 mg/kg	78.4	50.0	140	
		benzo(k)fluoranthene	207-08-9	E641A	0.331 mg/kg	0.5 mg/kg	87.8	50.0	140	
		chrysene	218-01-9	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		dibenz(a,h)anthracene	53-70-3	E641A	0.328 mg/kg	0.5 mg/kg	87.1	50.0	140	
		fluoranthene	206-44-0	E641A	0.355 mg/kg	0.5 mg/kg	94.2	50.0	140	
		fluorene	86-73-7	E641A	0.274 mg/kg	0.5 mg/kg	72.7	50.0	140	
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.313 mg/kg	0.5 mg/kg	83.0	50.0	140	
		methylnaphthalene, 1-	90-12-0	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		methylnaphthalene, 2-	91-57-6	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		naphthalene	91-20-3	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		phenanthrene	85-01-8	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		pyrene	129-00-0	E641A	0.320 mg/kg	0.5 mg/kg	84.9	50.0	140	
		quinoline	91-22-5	E641A	0.342 mg/kg	0.5 mg/kg	90.9	50.0	140	

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Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:						Refere	nce Material (RM) Re	port	
					RM Target Recovery (%) Recovery Limits (%)				
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 681792)								
	RM	pH (1:2 soil:water)		E108	8.06 pH units	98.4	96.0	104	
Organic / Inorga	nic Carbon (QCLot: 686	6565)							
	RM	carbon, total [TC], <63μm		E351A	1.4 %	101	80.0	120	
Organic / Inorga	nic Carbon (QCLot: 691	434)							
	RM	carbon, inorganic [IC], <63 μm		E354A	0.383 %	95.9	80.0	120	
Metals (QCLot: 6									
	RM	mercury	7439-97-6	E510	0.062 mg/kg	107	70.0	130	
Metals (QCLot: 6	80466)								
	RM	aluminum	7429-90-5	E440	9817 mg/kg	104	70.0	130	
	RM	antimony	7440-36-0	E440	3.99 mg/kg	111	70.0	130	
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	117	70.0	130	
	RM	barium	7440-39-3	E440	105 mg/kg	113	70.0	130	
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	108	70.0	130	
	RM	boron	7440-42-8	E440	8.5 mg/kg	112	40.0	160	
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	104	70.0	130	
	RM	calcium	7440-70-2	E440	31082 mg/kg	108	70.0	130	
	RM	chromium	7440-47-3	E440	101 mg/kg	105	70.0	130	
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	106	70.0	130	
	RM	copper	7440-50-8	E440	123 mg/kg	109	70.0	130	
	RM	iron	7439-89-6	E440	23558 mg/kg	106	70.0	130	
	RM	lead	7439-92-1	E440	267 mg/kg	107	70.0	130	
	RM	lithium	7439-93-2	E440	9.5 mg/kg	106	70.0	130	
	RM	magnesium	7439-95-4	E440	5509 mg/kg	104	70.0	130	
	RM	manganese	7439-96-5	E440	269 mg/kg	110	70.0	130	
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	108	70.0	130	
	RM	nickel	7440-02-0	E440	26.7 mg/kg	106	70.0	130	
	RM	phosphorus	7723-14-0	E440	752 mg/kg	104	70.0	130	
	RM	potassium	7440-09-7	E440	1587 mg/kg	104	70.0	130	

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Sub-Matrix:				Refere	Reference Material (RM) Report					
					RM Target	Recovery (%)	Recovery	Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier	
Metals (QCLot:	680466) - continued									
·	RM	silver	7440-22-4	E440	4.06 mg/kg	124	70.0	130		
	RM	sodium	7440-23-5	E440	797 mg/kg	103	70.0	130		
	RM	strontium	7440-24-6	E440	86.1 mg/kg	108	70.0	130		
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	107	40.0	160		
	RM	tin	7440-31-5	E440	10.6 mg/kg	107	70.0	130		
	RM	titanium	7440-32-6	E440	839 mg/kg	104	70.0	130		
	RM	uranium	7440-61-1	E440	0.52 mg/kg	102	70.0	130		
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	105	70.0	130		
	RM	zinc	7440-66-6	E440	297 mg/kg	100	70.0	130		
	RM	zirconium	7440-67-7	E440	5.73 mg/kg	108	70.0	130		

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	Regular (c	default)		Sampler's Na	me	Τ,		leni	nifer In	gs.	**:	51956	003444	T				<u> </u>	<u></u>		1
	-3 business days) - 50% sur 1 Business Day) - 100% sur	rcharge X				1	رسامات					 -		 							-
For Emergency <1 Day,				Sampler's Signa	stura	1	*******	1 27	,			1 Date	/Time			Sent	ember 22	z. 2022			1

ALS Canada Ltd.



CERTIFICATE OF ANALYSIS

Work Order : **CG2213623** Page : 1 of 18

Client : Teck Coal Limited Laboratory : Calgary - Environmental

Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets

Address : 421 Pine Avenue Address : 2559 20th Street NE

: 421 Pine Avenue Address : 2559 29th Street NE
Sparwood BC Canada V0B2G0 Calgary AB Canada T1Y 7B5

Telephone : --- Telephone : +1 403 407 1800

 Project
 : Regional Effects Program
 Date Samples Received
 : 04-Oct-2022 09:00

 PO
 : VPO00816101
 Date Analysis Commenced
 : 05-Oct-2022

Sampler : Jennifer Ings

Site : ----

Quote number : Teck Coal Master Quote

No. of samples received : 6
No. of samples analysed : 6

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Sask Soils, Saskatoon, Saskatchewan	
Jeanie Mark	Laboratory Analyst	Organics, Calgary, Alberta	
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia	
Sorina Motea	Laboratory Analyst	Organics, Calgary, Alberta	
Vishnu Patel		Inorganics, Calgary, Alberta	
Xihua Yao	Laboratory Analyst	Inorganics, Saskatoon, Saskatchewan	
Xihua Yao	Laboratory Analyst	Sask Soils, Saskatoon, Saskatchewan	

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 CG2213623

 Client
 :
 Teck Coal Limited



General Comments

Project

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

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

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

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

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

Unit	Description
-	No Unit
%	percent
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

>: greater than.

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

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

Regional Effects Program

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

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Work Order : CG2213623
Client : Teck Coal Limited
Project : Regional Effects Program



Sub-Matrix: Sediment			CI	ient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			-	ling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
Physical Tests					Result	Result	Result	Result	Result
moisture		E144	0.25	%	22.7	26.1	38.1	31.1	25.4
pH (1:2 soil:water)		E108	0.10	pH units	8.25	8.26	8.02	8.15	8.20
Particle Size									
grain size curve		E185A	-	-	See Attached	See Attached	See Attached	See Attached	See Attached
clay (<0.004mm)		EC184A	1.0	%	7.8	6.7	10.2	9.0	8.1
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	13.0	12.8	26.3	18.7	17.2
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	21.1	20.6	42.3	29.4	27.1
sand (0.125mm - 0.063mm)		EC184A	1.0	%	7.8	6.9	7.6	8.9	8.2
sand (0.25mm - 0.125mm)		EC184A	1.0	%	11.9	9.4	4.8	8.9	6.0
sand (0.5mm - 0.25mm)		EC184A	1.0	%	14.9	13.8	3.0	11.5	10.2
sand (1.0mm - 0.50mm)		EC184A	1.0	%	13.6	13.5	2.5	7.4	12.2
sand (2.0mm - 1.0mm)		EC184A	1.0	%	4.4	6.1	1.4	2.1	5.5
gravel (>2mm)		EC184A	1.0	%	5.5	10.2	1.9	4.1	5.5
Organic / Inorganic Carbon									
carbon, total [TC]		E351	0.050	%	11.5	9.70	22.4	13.7	14.8
carbon, inorganic [IC]		E354	0.050	%	0.332	0.336	0.409	0.360	0.378
carbon, inorganic [IC], (as CaCO3 equivalent)		E354	0.40	%	2.77	2.80	3.41	3.00	3.15
carbon, total organic [TOC]		EC356	0.050	%	11.2	9.36	22.0	13.3	14.4
Metals									
aluminum	7429-90-5	E440	50	mg/kg	9440	8130	6860	9840	10600
antimony	7440-36-0	E440	0.10	mg/kg	0.90	0.89	0.86	0.97	0.88
arsenic	7440-38-2	E440	0.10	mg/kg	6.89	6.99	5.22	6.81	6.46
barium	7440-39-3	E440	0.50	mg/kg	318	312	306	347	370
beryllium	7440-41-7	E440	0.10	mg/kg	0.83	0.78	0.73	0.81	0.81
bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
boron	7440-42-8	E440	5.0	mg/kg	7.6	5.4	5.4	8.2	9.5
cadmium	7440-43-9	E440	0.020	mg/kg	0.809	0.918	0.978	0.958	0.891
calcium	7440-70-2	E440	50	mg/kg	11800	12000	13400	12700	12200

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Client : Teck Coal Limited
Project : Regional Effects Program



Analytical Results									
Sub-Matrix: Sediment			CI	ient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
				ling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Metals		E440	0.50		10.0	44.0	44.4	44.0	44.0
chromium	7440-47-3	E440	0.50	mg/kg	13.3	11.6	11.1	14.6	14.9
cobalt	7440-48-4	E440	0.10	mg/kg	11.5	11.1	7.57	10.7	10.3
copper	7440-50-8	E440	0.50	mg/kg	19.8	20.0	21.6	21.0	20.4
iron	7439-89-6	E440	50	mg/kg	20400	19500	12700	18800	18700
lead	7439-92-1	E440	0.50	mg/kg	14.0	13.6	11.6	13.4	12.7
lithium	7439-93-2	E440	2.0	mg/kg	13.5	12.4	8.9	12.3	13.1
magnesium	7439-95-4	E440	20	mg/kg	4410	3920	3420	4090	4100
manganese	7439-96-5	E440	1.0	mg/kg	548	622	357	508	486
mercury	7439-97-6	E510	0.0050	mg/kg	0.0623	0.0668	0.0898	0.0737	0.0748
molybdenum	7439-98-7	E440	0.10	mg/kg	1.40	1.42	1.27	1.45	1.34
nickel	7440-02-0	E440	0.50	mg/kg	33.8	33.1	25.8	33.3	31.2
phosphorus	7723-14-0	E440	50	mg/kg	1340	1300	1020	1270	1300
potassium	7440-09-7	E440	100	mg/kg	1850	1500	1380	2060	2270
selenium	7782-49-2	E440	0.20	mg/kg	1.18	1.22	1.57	1.49	1.32
silver	7440-22-4	E440	0.10	mg/kg	0.25	0.27	0.37	0.30	0.27
sodium	7440-23-5	E440	50	mg/kg	63	56	54	66	70
strontium	7440-24-6	E440	0.50	mg/kg	51.0	47.8	50.7	52.4	50.6
sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	<1000	<1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg	0.178	0.140	0.135	0.167	0.169
tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg	17.1	10.1	13.0	18.3	17.6
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg	0.825	0.845	1.00	0.941	0.881
vanadium	7440-62-2	E440	0.20	mg/kg	29.4	26.5	24.4	33.6	34.0
zinc	7440-66-6	E440	2.0	mg/kg	114	113	90.7	124	110
zirconium	7440-67-7	E440	1.0	mg/kg	1.3	1.2	1.4	1.1	1.0
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.050	mg/kg	0.092	0.167	0.384	0.204	0.138
acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	<0.050	0.056	<0.050	<0.050
acridine	260-94-6	E641A	0.050	mg/kg	0.140	0.282	0.646	0.320	0.218

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Sub-Matrix: Sediment			CI	ient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			Client samp	ling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Polycyclic Aromatic Hydrocarbons									
anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	<0.050	0.090	0.206	0.108	0.070
benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	<0.050	0.060	0.123	0.064	<0.050
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.130	0.248	0.507	0.268	0.184
benzo(b+j+k)fluoranthene	n/a	E641A	0.075	mg/kg	0.130	0.248	0.567	0.268	0.184
benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	0.056	0.094	0.187	0.097	0.065
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	<0.050	0.060	<0.050	<0.050
chrysene	218-01-9	E641A	0.050	mg/kg	0.303	0.537	1.13	0.579	0.430
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	<0.050	0.091	<0.050	<0.050
fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	0.073	0.162	0.084	0.057
fluorene	86-73-7	E641A	0.050	mg/kg	0.214	0.395	0.947	0.476	0.320
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	0.059	<0.050	<0.050
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	1.32	2.38	5.49	2.80	1.94
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	3.87	7.03	16.3	8.32	5.75
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	2.55	4.65	10.8	5.52	3.81
naphthalene	91-20-3	E641A	0.010	mg/kg	0.858	1.57	3.74	1.84	1.28
phenanthrene	85-01-8	E641A	0.050	mg/kg	0.982	1.79	4.09	2.15	1.47
pyrene	129-00-0	E641A	0.050	mg/kg	0.105	0.180	0.386	0.210	0.148
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	0.074	0.130	0.310	0.138	0.085
IACR (CCME)		E641A	0.60	-	1.38	2.53	5.48	2.74	1.92
IACR AB (coarse)		E641A	0.10	-	<0.10	<0.10	0.19	<0.10	<0.10
IACR AB (fine)		E641A	0.10	-	0.10	0.16	0.36	0.18	0.13
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	5.10	9.51	22.1	11.2	7.72
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	2.74	5.20	12.1	6.08	4.16
Polycyclic Aromatic Hydrocarbons Surrogates									
acridine-d9	34749-75-2	E641A	0.1	%	98.8	98.0	93.2	96.7	98.4
chrysene-d12	1719-03-5	E641A	0.1	%	122	119	116	120	121
naphthalene-d8	1146-65-2	E641A	0.1	%	116	112	113	112	113
phenanthrene-d10	1517-22-2	E641A	0.1	%	113	111	112	110	112

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Sub-Matrix: Sediment	ient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5			
(Matrix: Soil/Solid)				·	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			Client samp	ling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Exchangeable & Adsorbed Metals									
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	<50	<50	<50
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
barium, leachable	7440-39-3	E450	0.50	mg/kg	44.2	46.1	55.9	48.6	46.8
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.152	0.173	0.201	0.166	0.177
calcium, leachable	7440-70-2	E450	50	mg/kg	3750	3800	5520	4470	4530
chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.17	0.24	0.30	0.22	0.17
copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	<50	<50	<50
lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450	1.0	mg/kg	36.1	56.7	109	59.6	40.4
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	<50	<50	<50
potassium, leachable	7440-09-7	E450	100	mg/kg	140	130	140	150	140
selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	<100	<100	<100
strontium, leachable	7440-24-6	E450	0.50	mg/kg	12.9	12.6	16.8	15.0	14.6
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Carbonate Metals									

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Work Order : CG2213623
Client : Teck Coal Limited
Project : Regional Effects Program



Client sample ID RG_GAUT_SE-1 RG_GAUT_SE-2 RG_GAUT_SE-2 2022-09-14_N 2022-09-14_N 2022-09-14_N 2022-09-14_N		RG_GAUT_SE-5 _2022-09-14_N 14-Sep-2022 13:42 CG2213623-005
Analyte CAS Number Method LOR Unit CG2213623-001 CG2213623-002 CG2213623-003 Result Result Result Result	13:00 CG2213623-004	13:42 CG2213623-005
Result Result Result Result Carbonate Metals aluminum, leachable 7429-90-5 E450A 50 mg/kg <50 <50 <50 antimony, leachable 7440-36-0 E450A 0.10 mg/kg <0.10 <0.10 <0.10		
Carbonate Metals aluminum, leachable 7429-90-5 E450A 50 mg/kg <50	Result	
aluminum, leachable 7429-90-5 E450A 50 mg/kg <50		Result
antimony, leachable 7440-36-0 E450A 0.10 mg/kg <0.10 <0.10	<50	<50
	<0.10	<0.10
	0.068	<0.050
arsenic, leachable 7440-38-2 E450A 0.050 mg/kg 0.054 0.058 0.105 barium, leachable 7440-39-3 E450A 2.0 mg/kg 35.7 35.0 31.3	36.2	34.7
3 3		
beryllium, leachable 7440-41-7 E450A 0.20 mg/kg <0.20	<0.20 <0.20	<0.20 <0.20
110 00 0	0.193	0.175
calcium, leachable 7440-70-2 E450A 50 mg/kg 2760 3010 2990	2870	3010
chromium, leachable 7440-47-3 E450A 5.0 mg/kg <5.0	<5.0	<5.0
cobalt, leachable 7440-48-4 E450A 0.10 mg/kg 0.70 0.71 0.79	0.80	0.60
copper, leachable 7440-50-8 E450A 0.50 mg/kg <0.50	<0.50	<0.50
iron, leachable 7439-89-6 E450A 50 mg/kg <50	<50	<50
lead, leachable 7439-92-1 E450A 0.50 mg/kg <0.50	<0.50	<0.50
lithium, leachable 7439-93-2 E450A 5.0 mg/kg <5.0	<5.0	<5.0
manganese, leachable 7439-96-5 E450A 5.0 mg/kg 101 96.6 107	111	97.1
molybdenum, leachable 7439-98-7 E450A 0.50 mg/kg <0.50	<0.50	<0.50
nickel, leachable 7440-02-0 E450A 2.0 mg/kg <2.0	<2.0	<2.0
phosphorus, leachable 7723-14-0 E450A 50 mg/kg <50	<50	<50
selenium, leachable 7782-49-2 E450A 0.20 mg/kg <0.20	<0.20	<0.20
silver, leachable 7440-22-4 E450A 0.10 mg/kg <0.10	<0.10	<0.10
strontium, leachable 7440-24-6 E450A 5.0 mg/kg 5.4 5.8 5.6	5.7	5.6
thallium, leachable 7440-28-0 E450A 0.050 mg/kg <0.050 <0.050 <0.050	<0.050	<0.050
tin, leachable 7440-31-5 E450A 2.0 mg/kg <2.0	<2.0	<2.0
titanium, leachable 7440-32-6 E450A 5.0 mg/kg <5.0	<5.0	<5.0
uranium, leachable 7440-61-1 E450A 0.050 mg/kg <0.050	0.059	0.067
vanadium, leachable 7440-62-2 E450A 0.20 mg/kg <0.20	<0.20	<0.20
zinc, leachable 7440-66-6 E450A 1.0 mg/kg 5.0 4.7 4.6	5.3	4.7
Easily Reducible Metals and Iron Oxides		ļ.
aluminum, leachable 7429-90-5 E450B 50 mg/kg 595 609 579	628	592
antimony, leachable 7440-36-0 E450B 0.10 mg/kg <0.10	<0.10	<0.10

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Work Order : CG2213623
Client : Teck Coal Limited
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Sub-Matrix: Sediment			CI	lient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			Client samp	lling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Easily Reducible Metals and Iron Oxides		EAFOR	0.050		0.540	0.550	0.000	0.550	0.525
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.516	0.556	0.686	0.550	0.535
barium, leachable	7440-39-3	E450B	0.50	mg/kg	51.3	50.8	50.9	53.6	54.6
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.30	0.29	0.35	0.30	0.27
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg 	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg 	0.385	0.445	0.560	0.489	0.422
calcium, leachable	7440-70-2	E450B	50	mg/kg	3020	3320	3460	3300	3270
chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.80	0.90	0.75	0.75	0.71
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	4.46	4.17	3.18	4.08	3.72
copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.69	0.65	0.53	0.57	0.55
iron, leachable	7439-89-6	E450B	50	mg/kg	3810	3680	3310	3680	3560
lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.26	3.19	2.82	3.05	2.86
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	218	191	118	195	262
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	11.3	10.6	9.49	10.8	10.8
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	183	142	180	132	143
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
silver, leachable	7440-22-4	E450B	0.10	mg/kg	0.10	0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	6.18	6.63	6.87	6.72	6.59
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.161	0.178	0.217	0.188	0.195
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.78	2.90	2.42	2.63	2.64
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	26.5	26.4	26.1	26.8	24.4
Organic Bound Metals									
aluminum, leachable	7429-90-5	E450C	50	mg/kg	1850	1740	2260	2000	1950
antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.408	0.495	0.886	0.596	0.723
barium, leachable	7440-39-3	E450C	0.50	mg/kg	25.3	23.7	25.6	25.3	25.1

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Sub-Matrix: Sediment			CI	lient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			Client samp	oling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Organic Bound Metals									
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.080	0.085	0.118	0.094	0.080
calcium, leachable	7440-70-2	E450C	50	mg/kg	1040	1050	1140	1140	1120
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.66	3.77	5.43	4.21	4.05
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.10	1.03	1.40	1.24	1.18
copper, leachable	7440-50-8	E450C	0.50	mg/kg	6.38	7.32	12.9	8.60	8.14
iron, leachable	7439-89-6	E450C	50	mg/kg	1890	1960	2960	2380	2490
lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.80	0.88	1.90	1.14	1.22
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	19.9	17.1	15.0	19.4	23.4
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	6.08	6.02	8.69	6.96	6.78
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	0.90	1.01	1.64	1.17	1.11
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.75	4.64	4.86	4.95	4.97
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	1.7	2.2	3.9	2.3	2.4
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.255	0.279	0.432	0.329	0.338
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.26	4.45	6.59	5.37	5.32
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	8.9	9.1	14.6	10.5	10.2
Residual Metals									
aluminum, leachable	7429-90-5	E450D	50	mg/kg	8080	7710	5480	6410	7120
antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.70	0.76	0.73	0.69	0.74
arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	<5.00	<5.00	<5.00	<5.00
barium, leachable	7440-39-3	E450D	2.0	mg/kg	120	126	114	126	130
beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.38	0.33	0.32	0.31	0.36
bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20
cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.074	0.074	0.060	0.073	0.079
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Analytical Results

Sub-Matrix: Sediment			CI	ient sample ID	RG_GAUT_SE-1	RG_GAUT_SE-2	RG_GAUT_SE-3	RG_GAUT_SE-4	RG_GAUT_SE-5
(Matrix: Soil/Solid)					_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N	_2022-09-14_N
			Client samp	ling date / time	14-Sep-2022 09:10	14-Sep-2022 10:40	14-Sep-2022 11:45	14-Sep-2022 13:00	14-Sep-2022 13:42
Analyte	CAS Number	Method	LOR	Unit	CG2213623-001	CG2213623-002	CG2213623-003	CG2213623-004	CG2213623-005
					Result	Result	Result	Result	Result
Residual Metals									
calcium, leachable	7440-70-2	E450D	50	mg/kg	678	518	173	348	403
chromium, leachable	7440-47-3	E450D	5.0	mg/kg	11.4	11.0	7.9	9.2	10.0
cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.85	2.78	2.18	2.70	2.54
copper, leachable	7440-50-8	E450D	0.50	mg/kg	12.3	12.6	10.8	11.9	11.0
iron, leachable	7439-89-6	E450D	50	mg/kg	11600	10400	6430	9620	8610
lead, leachable	7439-92-1	E450D	0.50	mg/kg	7.04	6.99	6.04	6.94	6.40
lithium, leachable	7439-93-2	E450D	5.0	mg/kg	7.0	6.4	<5.0	5.4	5.6
manganese, leachable	7439-96-5	E450D	5.0	mg/kg	43.4	39.9	26.5	38.0	34.5
molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.96	1.07	0.86	0.90	0.94
nickel, leachable	7440-02-0	E450D	2.0	mg/kg	11.4	11.4	8.3	10.4	9.9
selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.46	0.35	0.43	0.48	0.46
silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.12	0.14	0.28	0.18	0.16
strontium, leachable	7440-24-6	E450D	5.0	mg/kg	19.1	20.8	19.1	18.1	19.2
thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.137	0.145	0.118	0.122	0.155
tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
titanium, leachable	7440-32-6	E450D	5.0	mg/kg	16.8	24.8	24.6	19.4	25.2
uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.346	0.339	0.281	0.291	0.325
vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	28.9	28.6	23.0	24.3	26.9
zinc, leachable	7440-66-6	E450D	1.0	mg/kg	62.7	59.9	45.8	57.7	54.4

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

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Sub-Matrix: Sediment			C	lient sample ID	RG_RIVER_SE-2		 	
			Ci	ioni dampie iD	_2022-09-14_N		 	
(Matrix: Soil/Solid)								
			Client samp	ling date / time	14-Sep-2022 10:40		 	
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006		 	
					Result		 	
Physical Tests								
moisture		E144	0.25	%	38.6		 	
pH (1:2 soil:water)		E108	0.10	pH units	8.35		 	
Particle Size								
grain size curve		E185A	-	-	See Attached		 	
clay (<0.004mm)		EC184A	1.0	%	5.0		 	
silt (0.063mm - 0.0312mm)		EC184A	1.0	%	21.7		 	
silt (0.0312mm - 0.004mm)		EC184A	1.0	%	24.2		 	
sand (0.125mm - 0.063mm)		EC184A	1.0	%	21.9		 	
sand (0.25mm - 0.125mm)		EC184A	1.0	%	13.7		 	
sand (0.5mm - 0.25mm)		EC184A	1.0	%	4.7		 	
sand (1.0mm - 0.50mm)		EC184A	1.0	%	2.2		 	
sand (2.0mm - 1.0mm)		EC184A	1.0	%	3.6		 	
gravel (>2mm)		EC184A	1.0	%	3.0		 	
Organic / Inorganic Carbon								
carbon, total [TC]		E351	0.050	%	3.58		 	
carbon, inorganic [IC]		E354	0.050	%	0.981		 	
carbon, inorganic [IC], (as CaCO3 equivalent)		E354	0.40	%	8.18		 	
carbon, total organic [TOC]		EC356	0.050	%	2.60		 	
Metals								
aluminum	7429-90-5	E440	50	mg/kg	16200		 	
antimony	7440-36-0	E440	0.10	mg/kg	0.40		 	
arsenic	7440-38-2	E440	0.10	mg/kg	7.82		 	
barium	7440-39-3	E440	0.50	mg/kg	700		 	
beryllium	7440-41-7	E440	0.10	mg/kg	0.86		 	
bismuth	7440-69-9	E440	0.20	mg/kg	0.23		 	
boron	7440-42-8	E440	5.0	mg/kg	17.9		 	
cadmium	7440-43-9	E440	0.020	mg/kg	0.844		 	
calcium	7440-70-2	E440	50	mg/kg	25500		 	
chromium	7440-47-3	E440	0.50	mg/kg	19.0		 	
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Analytical Results				_			
Sub-Matrix: Sediment			C	lient sample ID	RG_RIVER_SE-2	 	
(Matrix: Soil/Solid)					_2022-09-14_N		
			Client samp	oling date / time	14-Sep-2022 10:40	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 	
					Result	 	
Metals	- 110 10 I	E440	0.40		0.44		
cobalt	7440-48-4	E440	0.10	mg/kg	8.11	 	
copper	7440-50-8	E440	0.50	mg/kg	19.9	 	
iron	7439-89-6	E440	50	mg/kg	23500	 	
lead	7439-92-1	E440	0.50	mg/kg	13.6	 	
lithium	7439-93-2	E440	2.0	mg/kg	25.4	 	
magnesium	7439-95-4	E440	20	mg/kg	8220	 	
manganese	7439-96-5	E440	1.0	mg/kg	324	 	
mercury	7439-97-6	E510	0.0050	mg/kg 	0.0286	 	
molybdenum	7439-98-7	E440	0.10	mg/kg 	2.19	 	
nickel	7440-02-0	E440	0.50	mg/kg	24.8	 	
phosphorus	7723-14-0	E440	50	mg/kg	1560	 	
potassium	7440-09-7	E440	100	mg/kg	3380	 	
selenium	7782-49-2	E440	0.20	mg/kg	0.67	 	
silver	7440-22-4	E440	0.10	mg/kg	0.13	 	
sodium	7440-23-5	E440	50	mg/kg	273	 	
strontium	7440-24-6	E440	0.50	mg/kg	97.7	 	
sulfur	7704-34-9	E440	1000	mg/kg	<1000	 	
thallium	7440-28-0	E440	0.050	mg/kg	0.423	 	
tin	7440-31-5	E440	2.0	mg/kg	<2.0	 	
titanium	7440-32-6	E440	1.0	mg/kg	20.8	 	
tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	 	
uranium	7440-61-1	E440	0.050	mg/kg	0.712	 	
vanadium	7440-62-2	E440	0.20	mg/kg	31.2	 	
zinc	7440-66-6	E440	2.0	mg/kg	101	 	
zirconium	7440-67-7	E440	1.0	mg/kg	1.0	 	
Polycyclic Aromatic Hydrocarbons							
acenaphthene	83-32-9	E641A	0.050	mg/kg	<0.050	 	
acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	 	
acridine	260-94-6	E641A	0.050	mg/kg	<0.050	 	
anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	 	

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Sub Metrica Sediment			CI	lient sample ID	DC DIVED SE 2		
Sub-Matrix: Sediment			CI.	ient sample ib	RG_RIVER_SE-2 _2022-09-14_N	 	
(Matrix: Soil/Solid)					_2022-03-14_N		
			Client samp	oling date / time	14-Sep-2022	 	
Analyta	CAS Number	Method	LOR	Unit	10:40 CG2213623-006	 	
Analyte	CAS Number	Welliou	LON	Offic	Result	 	
Polycyclic Aromatic Hydrocarbons					resuit		
benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	<0.050	 	
benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	<0.050	 	
benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	<0.050	 	
benzo(b+j+k)fluoranthene	n/a	E641A	0.075	mg/kg	<0.075	 	
benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	<0.050	 	
benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	 	
chrysene	218-01-9	E641A	0.050	mg/kg	<0.050	 	
dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	 	
fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	 	
fluorene	86-73-7	E641A	0.050	mg/kg	<0.050	 	
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	 	
methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	0.031	 	
methylnaphthalene, 1+2-		E641A	0.050	mg/kg	0.077	 	
methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	0.046	 	
naphthalene	91-20-3	E641A	0.010	mg/kg	0.037	 	
phenanthrene	85-01-8	E641A	0.050	mg/kg	0.069	 	
pyrene	129-00-0	E641A	0.050	mg/kg	<0.050	 	
quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	 	
B(a)P total potency equivalents [B(a)P TPE]		E641A	0.065	mg/kg	<0.065	 	
IACR (CCME)		E641A	0.60	-	<0.60	 	
IACR AB (coarse)		E641A	0.10	-	<0.10	 	
IACR AB (fine)		E641A	0.10	-	<0.10	 	
PAHs, total (BC Sched 3.4)	n/a	E641A	0.20	mg/kg	<0.20	 	
PAHs, total (EPA 16)	n/a	E641A	0.20	mg/kg	<0.20	 	
Polycyclic Aromatic Hydrocarbons Surrogates							
acridine-d9	34749-75-2	E641A	0.1	%	103	 	
chrysene-d12	1719-03-5	E641A	0.1	%	128	 	
naphthalene-d8	1146-65-2	E641A	0.1	%	111	 	
phenanthrene-d10	1517-22-2	E641A	0.1	%	111	 	
Exchangeable & Adsorbed Metals							

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Project : Regional Effects Program



Analytical Nesults							
Sub-Matrix: Sediment			C	lient sample ID	RG_RIVER_SE-2	 	
(Matrix: Soil/Solid)					_2022-09-14_N		
				oling date / time	14-Sep-2022 10:40	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 	
					Result	 	
Exchangeable & Adsorbed Metals		E450	50		-50		
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	 	
antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	 	
arsenic, leachable	7440-38-2	E450	0.050	mg/kg	0.052	 	
barium, leachable	7440-39-3	E450	0.50	mg/kg	224	 	
beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	 	
bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	 	
cadmium, leachable	7440-43-9	E450	0.050	mg/kg	<0.050	 	
calcium, leachable	7440-70-2	E450	50	mg/kg	2500	 	
chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	 	
cobalt, leachable	7440-48-4	E450	0.10	mg/kg	<0.10	 	
copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50	 	
iron, leachable	7439-89-6	E450	50	mg/kg	<50	 	
lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	 	
lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	 	
manganese, leachable	7439-96-5	E450	1.0	mg/kg	32.3	 	
molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	 	
nickel, leachable	7440-02-0	E450	0.50	mg/kg	<0.50	 	
phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	 	
potassium, leachable	7440-09-7	E450	100	mg/kg	190	 	
selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	 	
silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	 	
sodium, leachable	7440-23-5	E450	100	mg/kg	350	 	
strontium, leachable	7440-24-6	E450	0.50	mg/kg	42.4	 	
thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	 	
tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	 	
titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	 	
uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	 	
vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	 	
zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	 	
Carbonate Metals							

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Client : Teck Coal Limited
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Sub-Matrix: Sediment			C	lient sample ID	RG_RIVER_SE-2	 	
			O,	.c oumpio ID	_2022-09-14_N	 	
(Matrix: Soil/Solid)					_2022-00-14_1(
			Client samp	oling date / time	14-Sep-2022 10:40	 	
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 	
					Result	 	
Carbonate Metals							
aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	 	
antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	 	
arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.164	 	
barium, leachable	7440-39-3	E450A	2.0	mg/kg	123	 	
beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	 	
bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	 	
cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.245	 	
calcium, leachable	7440-70-2	E450A	50	mg/kg	13800	 	
chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	 	
cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	1.42	 	
copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	 	
iron, leachable	7439-89-6	E450A	50	mg/kg	563	 	
lead, leachable	7439-92-1	E450A	0.50	mg/kg	1.19	 	
lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	 	
manganese, leachable	7439-96-5	E450A	5.0	mg/kg	126	 	
molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	 	
nickel, leachable	7440-02-0	E450A	2.0	mg/kg	2.1	 	
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	 	
selenium, leachable	7782-49-2	E450A	0.20	mg/kg	<0.20	 	
silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	 	
strontium, leachable	7440-24-6	E450A	5.0	mg/kg	27.7	 	
thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	 	
tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	 	
titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	 	
uranium, leachable	7440-61-1	E450A	0.050	mg/kg	0.055	 	
vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	 	
zinc, leachable	7440-66-6	E450A	1.0	mg/kg	9.1	 	
Easily Reducible Metals and Iron Oxides							
aluminum, leachable	7429-90-5	E450B	50	mg/kg	655	 	
antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	 	
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Analytical Results								
Sub-Matrix: Sediment			CI	lient sample ID	RG_RIVER_SE-2	 		
(Matrix: Soil/Solid)					_2022-09-14_N			
				lling date / time	14-Sep-2022 10:40	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 		
					Result	 		
Easily Reducible Metals and Iron Oxides								
arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.865	 		
barium, leachable	7440-39-3	E450B	0.50	mg/kg	82.6	 		
beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.24	 		
bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.358	 		
calcium, leachable	7440-70-2	E450B	50	mg/kg	8360	 		
chromium, leachable	7440-47-3	E450B	0.50	mg/kg	1.50	 		
cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	2.37	 		
copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.90	 		
iron, leachable	7439-89-6	E450B	50	mg/kg	4140	 		
lead, leachable	7439-92-1	E450B	0.50	mg/kg	4.56	 		
lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	 		
manganese, leachable	7439-96-5	E450B	1.0	mg/kg	90.3	 		
molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	 		
nickel, leachable	7440-02-0	E450B	0.50	mg/kg	5.43	 		
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	74	 		
selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	 		
silver, leachable	7440-22-4	E450B	0.10	mg/kg	<0.10	 		
strontium, leachable	7440-24-6	E450B	0.50	mg/kg	12.0	 		
thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	 		
tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	 		
titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	 		
uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.123	 		
vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.88	 		
zinc, leachable	7440-66-6	E450B	1.0	mg/kg	24.4	 		
Organic Bound Metals								
aluminum, leachable	7429-90-5	E450C	50	mg/kg	1280	 		
antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	 		
arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.075	 		
barium, leachable	7440-39-3	E450C	0.50	mg/kg	18.8	 		
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Analytical Nesults								
Sub-Matrix: Sediment			C	lient sample ID	RG_RIVER_SE-2	 		
(Matrix: Soil/Solid)					_2022-09-14_N			
				oling date / time	14-Sep-2022 10:40	 		
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 		
					Result	 		
Organic Bound Metals								
beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	 		
bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	<0.050	 		
calcium, leachable	7440-70-2	E450C	50	mg/kg	864	 		
chromium, leachable	7440-47-3	E450C	0.50	mg/kg	2.40	 		
cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	0.75	 		
copper, leachable	7440-50-8	E450C	0.50	mg/kg	3.82	 		
iron, leachable	7439-89-6	E450C	50	mg/kg	1090	 		
lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.64	 		
lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	 		
manganese, leachable	7439-96-5	E450C	1.0	mg/kg	8.2	 		
molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	 		
nickel, leachable	7440-02-0	E450C	0.50	mg/kg	3.59	 		
selenium, leachable	7782-49-2	E450C	0.20	mg/kg	0.36	 		
silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	 		
strontium, leachable	7440-24-6	E450C	0.50	mg/kg	3.51	 		
thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	 		
tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	 		
titanium, leachable	7440-32-6	E450C	1.0	mg/kg	<1.0	 		
uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.099	 		
vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	1.53	 		
zinc, leachable	7440-66-6	E450C	1.0	mg/kg	5.9	 		
Residual Metals								
aluminum, leachable	7429-90-5	E450D	50	mg/kg	13700	 		
antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.32	 		
arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	6.60	 		
barium, leachable	7440-39-3	E450D	2.0	mg/kg	109	 		
beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.47	 		
bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	 		
cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.068	 		
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Analytical Results

•							
Sub-Matrix: Sediment			CI	lient sample ID	RG_RIVER_SE-2	 	
(Matrix: Soil/Solid)					_2022-09-14_N		
			Client samp	oling date / time	14-Sep-2022	 	
					10:40		
Analyte	CAS Number	Method	LOR	Unit	CG2213623-006	 	
					Result	 	
Residual Metals							
calcium, leachable	7440-70-2	E450D	50	mg/kg	1650	 	
chromium, leachable	7440-47-3	E450D	5.0	mg/kg	16.1	 	
cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.64	 	
copper, leachable	7440-50-8	E450D	0.50	mg/kg	13.4	 	
iron, leachable	7439-89-6	E450D	50	mg/kg	17200	 	
lead, leachable	7439-92-1	E450D	0.50	mg/kg	5.13	 	
lithium, leachable	7439-93-2	E450D	5.0	mg/kg	15.7	 	
manganese, leachable	7439-96-5	E450D	5.0	mg/kg	45.5	 	
molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	1.79	 	
nickel, leachable	7440-02-0	E450D	2.0	mg/kg	12.4	 	
selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.24	 	
silver, leachable	7440-22-4	E450D	0.10	mg/kg	<0.10	 	
strontium, leachable	7440-24-6	E450D	5.0	mg/kg	11.3	 	
thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.282	 	
tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	 	
titanium, leachable	7440-32-6	E450D	5.0	mg/kg	27.6	 	
uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.371	 	
vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	29.1	 	
zinc, leachable	7440-66-6	E450D	1.0	mg/kg	57.1	 	

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

ALS Canada Ltd.



QUALITY CONTROL REPORT

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Client : Teck Coal Limited Laboratory : Calgary - Environmental : Giovanna Diaz **Account Manager** Contact : Lyudmyla Shvets

> Address :421 Pine Avenue : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

Telephone Telephone :+1 403 407 1800 **Project** : Regional Effects Program Date Samples Received :04-Oct-2022 09:00

PO **Date Analysis Commenced** :05-Oct-2022 : VPO00816101

C-O-C number Issue Date :REP LAEMP GC 2022-09 ALS :20-Oct-2022 18:27

: Jennifer Ings ___ Site

Quote number : Teck Coal Master Quote

No. of samples received : 6

No. of samples analysed : 6

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

Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives

- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

Address

Sampler

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

Signatories	Position	Laboratory Department	
Anthony Calero	Supervisor - Inorganic	Calgary Metals, Calgary, Alberta	
Hedy Lai	Team Leader - Inorganics	Saskatoon Inorganics, Saskatoon, Saskatchewan	
Hedy Lai	Team Leader - Inorganics	Saskatoon Sask Soils, Saskatoon, Saskatchewan	
Jeanie Mark	Laboratory Analyst	Calgary Organics, Calgary, Alberta	
Robin Weeks	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia	
Sorina Motea	Laboratory Analyst	Calgary Organics, Calgary, Alberta	
Vishnu Patel		Calgary Inorganics, Calgary, Alberta	
Xihua Yao	Laboratory Analyst	Saskatoon Inorganics, Saskatoon, Saskatchewan	
Xihua Yao	Laboratory Analyst	Saskatoon Sask Soils, Saskatoon, Saskatchewan	

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General Comments

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

Key:

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

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

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

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

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

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

Sub-Matrix: Soil/Solid							Labora	atory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Physical Tests (QC	Lot: 696197)										
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	pH (1:2 soil:water)		E108	0.10	pH units	8.25	8.30	0.604%	5%	
Physical Tests (QC	Lot: 698658)										
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	moisture		E144	0.25	%	22.7	21.9	3.58%	20%	
Organic / Inorganic	Carbon (QC Lot: 685726	5)									
CG2213306-001	Anonymous	carbon, inorganic [IC]		E354	0.050	%	2.86	2.88	0.679%	20%	
Organic / Inorganic	Carbon (QC Lot: 686559	9)									
FJ2202326-001	Anonymous	carbon, total [TC]		E351	0.050	%	0.569	0.473	18.5%	20%	
Metals (QC Lot: 698	5754)										
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	mercury	7439-97-6	E510	0.0050	mg/kg	0.0623	0.0586	6.16%	40%	
Metals (QC Lot: 698	5755)										
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	aluminum	7429-90-5	E440	50	mg/kg	9440	9160	2.93%	40%	
		antimony	7440-36-0	E440	0.10	mg/kg	0.90	0.83	8.79%	30%	
		arsenic	7440-38-2	E440	0.10	mg/kg	6.89	6.68	3.09%	30%	
		barium	7440-39-3	E440	0.50	mg/kg	318	300	5.89%	40%	
		beryllium	7440-41-7	E440	0.10	mg/kg	0.83	0.76	9.04%	30%	
		bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		boron	7440-42-8	E440	5.0	mg/kg	7.6	6.8	0.8	Diff <2x LOR	
		cadmium	7440-43-9	E440	0.020	mg/kg	0.809	0.806	0.382%	30%	
		calcium	7440-70-2	E440	50	mg/kg	11800	11200	5.39%	30%	
		chromium	7440-47-3	E440	0.50	mg/kg	13.3	12.6	5.84%	30%	
		cobalt	7440-48-4	E440	0.10	mg/kg	11.5	11.4	1.09%	30%	
		copper	7440-50-8	E440	0.50	mg/kg	19.8	18.9	4.65%	30%	
		iron	7439-89-6	E440	50	mg/kg	20400	20600	0.506%	30%	
		lead	7439-92-1	E440	0.50	mg/kg	14.0	13.6	2.41%	40%	
		lithium	7439-93-2	E440	2.0	mg/kg	13.5	13.6	0.706%	30%	
		magnesium	7439-95-4	E440	20	mg/kg	4410	3790	14.9%	30%	
		manganese	7439-96-5	E440	1.0	mg/kg	548	514	6.31%	30%	
		molybdenum	7439-98-7	E440	0.10	mg/kg	1.40	1.34	4.61%	40%	

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Laboratory of Seminary Class ample (D) Analyte CAS Number CA	Sub-Matrix: Soil/Solid							Labora	tory Duplicate (D	UP) Report		
CG2213623-0101 RG CANT Se1_2022-010 Initial	Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit					Qualifier
14_N	Metals (QC Lot: 69	5755) - continued										
	CG2213623-001		nickel	7440-02-0	E440	0.50	mg/kg	33.8	33.0	2.44%	30%	
Selentum		_	phosphorus	7723-14-0	E440	50	mg/kg	1340	1350	0.757%	30%	
Select Part			potassium	7440-09-7	E440	100	mg/kg	1850	1750	5.38%	40%	
Sodium			selenium	7782-49-2	E440	0.20	mg/kg	1.18	1.12	0.07	Diff <2x LOR	
Storellium 7440-24-6 E440 0.50 mg/lkg 51.0 47.7 6.76% 40%			silver	7440-22-4	E440	0.10	mg/kg	0.25	0.22	0.03	Diff <2x LOR	
### Standard			sodium	7440-23-5	E440	50	mg/kg	63	59	4	Diff <2x LOR	
thallium 7440-28-0 E440 0.050 mg/kg 0.178 0.152 0.026 Diff <2x LOR			strontium	7440-24-6	E440	0.50	mg/kg	51.0	47.7	6.76%	40%	
tin 7440-31-5 E440 2.0 mg/kg < 2.0 < 2.0 0 Diff <2x LOR			sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	
Utanium			thallium	7440-28-0	E440	0.050	mg/kg	0.178	0.152	0.026	Diff <2x LOR	
tungsten uranium 7440-81-11 E440 0.50 mg/kg 0.825 0.810 1.88% 30% 7440-81-11 E440 0.050 mg/kg 0.825 0.810 1.88% 30% 7440-86-6 E440 0.20 mg/kg 0.825 0.810 1.88% 30% 740-86-6 E440 0.20 mg/kg 114 112 1.96% 30% 740-86-6 E440 0.20 mg/kg 114 112 1.96% 30% 740-86-6 E440 1.0 mg/kg 1.3 1.1 0.2 Diff-2x LOR 740-86-7 E440 1.0 mg/kg 1.3 1.1 0.2 Diff-2x LOR 740-86-7 E440 1.0 mg/kg 1.3 1.1 0.2 Diff-2x LOR 740-86-8 E441 0.050 mg/kg 0.092 0.096 0.004 Diff-2x LOR 740-86-8 E441 0.050 mg/kg 0.050 0.050 0 Diff-2x LOR 83-32-9 E641A 0.050 mg/kg 0.050 0.050 0 Diff-2x LOR 84-86-86-86-86-86-86-86-86-86-86-86-86-86-			tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
Uranium 7440-61-1 E440 0.050 mg/kg 0.825 0.810 1.88% 30%			titanium	7440-32-6	E440	1.0	mg/kg	17.1	12.7	29.1%	40%	
Vanadium			tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
zinc			uranium	7440-61-1	E440	0.050	mg/kg	0.825	0.810	1.88%	30%	
Polycyclic Aromatic Hydrocarbons (QC Lot: 698656)			vanadium	7440-62-2	E440	0.20	mg/kg	29.4	29.0	1.09%	30%	
Polycyclic Aromatic Hydrocarbons (QC Lot: 698656) CG2213623-001 RG_GAUT_SE:1_2022-09- acenaphthene 33-32-9 E641A 0.050 mg/kg 0.092 0.096 0.004 Diff <2x LOR			zinc	7440-66-6	E440	2.0	mg/kg	114	112	1.96%	30%	
CG2213623-001 RG_GAUT_SE-1_2022-09- 14_N acenaphthylene acenaphtylene acenaphthylene acenaphthylene acenaphtylene acetal A. 0.050 mg/kg 0.050			zirconium	7440-67-7	E440	1.0	mg/kg	1.3	1.1	0.2	Diff <2x LOR	
14_N	Polycyclic Aromatic	Hydrocarbons (QC Lot	: 698656)									
acenaphthylene 208-96-8 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR acridine acridine 260-94-6 E641A 0.050 mg/kg 0.140 0.166 0.027 Diff <2x LOR anthracene 120-12-7 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR benz(a)anthracene 56-55-3 E641A 0.050 mg/kg <0.050 0.050 0 Diff <2x LOR benz(a)pyrene 50-32-8 E641A 0.050 mg/kg <0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene n/a E641A 0.050 mg/kg 0.130 0.160 0.030 Diff <2x LOR benzo(b+j)fluoranthene 191-24-2 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 207-08-9 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 218-01-9 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 218-01-9 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 53-70-3 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 206-44-0 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 206-44-0 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 206-44-0 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 206-44-0 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 206-44-0 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR benzo(b+j)fluoranthene 193-39-5 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR	CG2213623-001		acenaphthene	83-32-9	E641A	0.050	mg/kg	0.092	0.096	0.004	Diff <2x LOR	
anthracene 120-12-7 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR		1.5.	acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
benz(a)anthracene 56-5-3 E641A 0.050 mg/kg <0.050 0.053 0.003 Diff <2x LOR			acridine	260-94-6	E641A	0.050	mg/kg	0.140	0.166	0.027	Diff <2x LOR	
benzo(a)pyrene 50-32-8 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR			anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
benzo(b+j)fluoranthene n/a E641A 0.050 mg/kg 0.130 0.160 0.030 Diff <2x LOR benzo(g,h,i)perylene 191-24-2 E641A 0.050 mg/kg 0.056 0.063 0.007 Diff <2x LOR benzo(k)fluoranthene 207-08-9 E641A 0.050 mg/kg 0.050 0.050 0 Diff <2x LOR chrysene 218-01-9 E641A 0.050 mg/kg 0.303 0.352 15.0% 50% dibenz(a,h)anthracene 53-70-3 E641A 0.050 mg/kg 0.050 0 Diff <2x LOR fluoranthene 206-44-0 E641A 0.050 mg/kg 0.050 0 Diff <2x LOR fluoranthene 86-73-7 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg 0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.050 mg/kg 1.32 1.42 7.31% 50%			benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	<0.050	0.053	0.003	Diff <2x LOR	
benzo(g,h,i)perylene 191-24-2 E641A 0.050 mg/kg 0.056 0.063 0.007 Diff <2x LOR			benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
benzo(k)fluoranthene 207-08-9 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR			benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	0.130	0.160	0.030	Diff <2x LOR	
chrysene 218-01-9 E641A 0.050 mg/kg 0.303 0.352 15.0% 50% dibenz(a,h)anthracene 53-70-3 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR fluoranthene 206-44-0 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR fluorene 86-73-7 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	0.056	0.063	0.007	Diff <2x LOR	
dibenz(a,h)anthracene 53-70-3 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR fluoranthene 206-44-0 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR fluorene 86-73-7 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
fluoranthene 206-44-0 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR fluorene 86-73-7 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			chrysene	218-01-9	E641A	0.050	mg/kg	0.303	0.352	15.0%	50%	
fluorene 86-73-7 E641A 0.050 mg/kg 0.214 0.228 6.18% 50% indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
indeno(1,2,3-c,d)pyrene 193-39-5 E641A 0.050 mg/kg <0.050 <0.050 0 Diff <2x LOR methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
methylnaphthalene, 1- 90-12-0 E641A 0.030 mg/kg 1.32 1.42 7.31% 50%			fluorene	86-73-7	E641A	0.050	mg/kg	0.214	0.228	6.18%	50%	
			indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
methylnaphthalene, 2- 91-57-6 E641A 0.030 mg/kg 2.55 2.69 5.28% 50%			methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	1.32	1.42	7.31%	50%	
			methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	2.55	2.69	5.28%	50%	

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Sub-Matrix: Soil/Solid							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
olycyclic Aromatic	Hydrocarbons (QC Lot	: 698656) - continued									
CG2213623-001	RG_GAUT_SE-1_2022-09-	naphthalene	91-20-3	E641A	0.010	mg/kg	0.858	0.911	6.05%	50%	
	14_N	phenanthrene	85-01-8	E641A	0.050	mg/kg	0.982	1.08	9.42%	50%	
		pyrene	129-00-0	E641A	0.050	mg/kg	0.105	0.116	0.011	Diff <2x LOR	
		quinoline	91-22-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
xchangeable & Ad	Isorbed Metals (QC Lot:	695314)									
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
	1.2.	antimony, leachable	7440-36-0	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450	0.50	mg/kg	44.2	41.7	5.62%	30%	
		beryllium, leachable	7440-41-7	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450	0.050	mg/kg	0.152	0.146	0.006	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450	50	mg/kg	3750	3710	0.948%	30%	
		chromium, leachable	7440-47-3	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450	0.10	mg/kg	0.17	0.17	0.004	Diff <2x LOR	
		copper, leachable	7440-50-8	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		iron, leachable	7439-89-6	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450	1.0	mg/kg	36.1	32.8	9.48%	30%	
		molybdenum, leachable	7439-98-7	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450	50	mg/kg	<50	<50	0	Diff <2x LOR	
		potassium, leachable	7440-09-7	E450	100	mg/kg	140	110	20	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		sodium, leachable	7440-23-5	E450	100	mg/kg	<100	<100	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450	0.50	mg/kg	12.9	12.9	0.0825%	30%	
		thallium, leachable	7440-28-0	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	

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Sub-Matrix: Soil/Solid		Laboratory Duplicate (DUP) Report									
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifie
Exchangeable & Ad	sorbed Metals (QC Lot:	695314) - continued									
CG2213623-001	RG_GAUT_SE-1_2022-09- 14 N	zinc, leachable	7440-66-6	E450	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
Carbonate Metals(
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	aluminum, leachable	7429-90-5	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
	13_1	antimony, leachable	7440-36-0	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450A	0.050	mg/kg	0.054	0.056	0.002	Diff <2x LOR	
		barium, leachable	7440-39-3	E450A	2.0	mg/kg	35.7	34.9	2.34%	30%	
		beryllium, leachable	7440-41-7	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450A	0.050	mg/kg	0.166	0.169	0.004	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450A	50	mg/kg	2760	2920	5.83%	30%	
		chromium, leachable	7440-47-3	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450A	0.10	mg/kg	0.70	0.64	8.88%	30%	
		copper, leachable	7440-50-8	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		iron, leachable	7439-89-6	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		lead, leachable	7439-92-1	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450A	5.0	mg/kg	101	100	0.987%	30%	
		molybdenum, leachable	7439-98-7	E450A	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450A	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	<50	0	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450A	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450A	5.0	mg/kg	5.4	5.7	0.4	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450A	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450A	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450A	0.050	mg/kg	<0.050	0.051	0.0009	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450A	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		zinc, leachable	7440-66-6	E450A	1.0	mg/kg	5.0	5.2	0.2	Diff <2x LOR	
Easily Reducible Me	etals and Iron Oxides(Q	C Lot: 697833)									
CG2213623-001	RG_GAUT_SE-1_2022-09-	aluminum, leachable	7429-90-5	E450B	50	mg/kg	595	596	0.176%	30%	
	14_N	antimony, leachable	7440-36-0	E450B	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450B	0.050	mg/kg	0.516	0.603	15.5%	30%	

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Sub-Matrix: Soil/Solid											
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Easily Reducible Me	tals and Iron Oxides (Q	C Lot: 697833) - continued									
CG2213623-001	RG_GAUT_SE-1_2022-09- 14 N	barium, leachable	7440-39-3	E450B	0.50	mg/kg	51.3	50.5	1.49%	30%	
		beryllium, leachable	7440-41-7	E450B	0.20	mg/kg	0.30	0.27	0.03	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450B	0.050	mg/kg	0.385	0.411	6.54%	30%	
		calcium, leachable	7440-70-2	E450B	50	mg/kg	3020	3320	9.62%	30%	
		chromium, leachable	7440-47-3	E450B	0.50	mg/kg	0.80	0.83	0.03	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450B	0.10	mg/kg	4.46	4.21	5.73%	30%	
		copper, leachable	7440-50-8	E450B	0.50	mg/kg	0.69	0.64	0.05	Diff <2x LOR	
		iron, leachable	7439-89-6	E450B	50	mg/kg	3810	3570	6.46%	30%	
		lead, leachable	7439-92-1	E450B	0.50	mg/kg	3.26	3.19	0.07	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450B	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450B	1.0	mg/kg	218	193	11.9%	30%	
		molybdenum, leachable	7439-98-7	E450B	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450B	0.50	mg/kg	11.3	11.2	0.818%	30%	
		phosphorus, leachable	7723-14-0	E450B	50	mg/kg	183	147	35	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450B	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		silver, leachable	7440-22-4	E450B	0.10	mg/kg	0.10	<0.10	0.006	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450B	0.50	mg/kg	6.18	6.58	6.24%	30%	
		thallium, leachable	7440-28-0	E450B	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450B	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450B	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450B	0.050	mg/kg	0.161	0.176	0.015	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450B	0.20	mg/kg	2.78	2.76	0.736%	30%	
		zinc, leachable	7440-66-6	E450B	1.0	mg/kg	26.5	27.9	5.24%	30%	
Owners a Description	-l- (OC L -t- 700070)	2.116, 1646.142.16				3, 3			-		
Organic Bound Meta CG2213623-001	RG GAUT SE-1 2022-09-	aluminum, leachable	7429-90-5	E450C	50	mg/kg	1850	1790	3.64%	30%	
002210020 001	14_N	auminum, reachable	7-120-00-0	24000	00	mg/kg	1000	1700	0.0470	0070	
		antimony, leachable	7440-36-0	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		arsenic, leachable	7440-38-2	E450C	0.050	mg/kg	0.408	0.463	12.6%	30%	
		barium, leachable	7440-39-3	E450C	0.50	mg/kg	25.3	22.8	10.4%	30%	
		beryllium, leachable	7440-41-7	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450C	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450C	0.050	mg/kg	0.080	0.082	0.002	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450C	50	mg/kg	1040	1030	1.28%	30%	

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Sub-Matrix: Soil/Solid							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Organic Bound Met	als (QC Lot: 702272) - c	ontinued									
CG2213623-001	RG_GAUT_SE-1_2022-09- 14_N	chromium, leachable	7440-47-3	E450C	0.50	mg/kg	3.66	3.62	0.996%	30%	
	_	cobalt, leachable	7440-48-4	E450C	0.10	mg/kg	1.10	1.01	8.37%	30%	
		copper, leachable	7440-50-8	E450C	0.50	mg/kg	6.38	6.65	4.16%	30%	
		iron, leachable	7439-89-6	E450C	50	mg/kg	1890	1910	1.12%	30%	
		lead, leachable	7439-92-1	E450C	0.50	mg/kg	0.80	0.88	0.08	Diff <2x LOR	
		lithium, leachable	7439-93-2	E450C	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	
		manganese, leachable	7439-96-5	E450C	1.0	mg/kg	19.9	16.8	16.9%	30%	
		molybdenum, leachable	7439-98-7	E450C	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450C	0.50	mg/kg	6.08	6.11	0.543%	30%	
		selenium, leachable	7782-49-2	E450C	0.20	mg/kg	0.90	0.94	0.04	Diff <2x LOR	
		silver, leachable	7440-22-4	E450C	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450C	0.50	mg/kg	4.75	4.63	2.63%	30%	
		thallium, leachable	7440-28-0	E450C	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	
		tin, leachable	7440-31-5	E450C	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450C	1.0	mg/kg	1.7	2.1	0.4	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450C	0.050	mg/kg	0.255	0.271	0.017	Diff <2x LOR	
		vanadium, leachable	7440-62-2	E450C	0.20	mg/kg	4.26	4.46	4.63%	30%	
		zinc, leachable	7440-66-6	E450C	1.0	mg/kg	8.9	8.9	0.125%	30%	
Residual Metals (Q	C Lot: 704532)										
CG2213623-001	RG_GAUT_SE-1_2022-09-	aluminum, leachable	7429-90-5	E450D	50	mg/kg	8080	7600	6.07%	30%	
	14_N	antimony, leachable	7440-36-0	E450D	0.10	mg/kg	0.70	0.77	9.57%	30%	
		arsenic, leachable	7440-38-2	E450D	5.00	mg/kg	<5.00	<5.00	0	Diff <2x LOR	
		barium, leachable	7440-39-3	E450D	2.0	mg/kg	120	131	8.45%	30%	
		beryllium, leachable	7440-41-7	E450D	0.20	mg/kg	0.38	0.37	0.008	Diff <2x LOR	
		bismuth, leachable	7440-69-9	E450D	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	
		cadmium, leachable	7440-43-9	E450D	0.050	mg/kg	0.074	0.081	0.008	Diff <2x LOR	
		calcium, leachable	7440-70-2	E450D	50	mg/kg	678	592	13.6%	30%	
		chromium, leachable	7440-47-3	E450D	5.0	mg/kg	11.4	10.8	0.6	Diff <2x LOR	
		cobalt, leachable	7440-48-4	E450D	0.10	mg/kg	2.85	2.75	3.73%	30%	
		copper, leachable	7440-50-8	E450D	0.50	mg/kg	12.3	12.1	2.08%	30%	
		iron, leachable	7439-89-6	E450D	50	mg/kg	11600	10200	13.0%	30%	
		lead, leachable	7439-92-1	E450D	0.50	mg/kg	7.04	7.14	1.38%	30%	
		lithium, leachable	7439-93-2	E450D	5.0	mg/kg	7.0	6.4	0.5	Diff <2x LOR	
		initialli, leachable	7 700-30-2	L-300	5.0	mg/kg	7.0	0.4	0.5	DIII 32X LOIX	1

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Sub-Matrix: Soil/Solid							Labora	tory Duplicate (DI	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Residual Metals (Q0	C Lot: 704532) - continu	ed									
CG2213623-001	RG_GAUT_SE-1_2022-09- 14 N	manganese, leachable	7439-96-5	E450D	5.0	mg/kg	43.4	40.0	8.05%	30%	
	_	molybdenum, leachable	7439-98-7	E450D	0.50	mg/kg	0.96	0.98	0.02	Diff <2x LOR	
		nickel, leachable	7440-02-0	E450D	2.0	mg/kg	11.4	10.8	0.6	Diff <2x LOR	
		selenium, leachable	7782-49-2	E450D	0.20	mg/kg	0.46	0.40	0.06	Diff <2x LOR	
		silver, leachable	7440-22-4	E450D	0.10	mg/kg	0.12	0.15	0.03	Diff <2x LOR	
		strontium, leachable	7440-24-6	E450D	5.0	mg/kg	19.1	21.8	2.7	Diff <2x LOR	
		thallium, leachable	7440-28-0	E450D	0.050	mg/kg	0.137	0.159	0.022	Diff <2x LOR	
		tin, leachable	7440-31-5	E450D	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	
		titanium, leachable	7440-32-6	E450D	5.0	mg/kg	16.8	22.1	5.3	Diff <2x LOR	
		uranium, leachable	7440-61-1	E450D	0.050	mg/kg	0.346	0.366	5.52%	30%	
		vanadium, leachable	7440-62-2	E450D	0.20	mg/kg	28.9	27.3	5.76%	30%	
		zinc, leachable	7440-66-6	E450D	1.0	mg/kg	62.7	60.7	3.31%	30%	

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Method Blank (MB) Report

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

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 698658)						
moisture		E144	0.25	%	<0.25	
rganic / Inorganic Carbon (QCI						
carbon, inorganic [IC]		E354	0.05	%	<0.050	
Organic / Inorganic Carbon(QCI						
carbon, total [TC]		E351	0.05	%	<0.050	
letals (QCLot: 695754)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	
letals (QCLot: 695755)						
aluminum	7429-90-5		50	mg/kg	<50	
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	
barium	7440-39-3	E440	0.5	mg/kg	<0.50	
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	
boron	7440-42-8	E440	5	mg/kg	<5.0	
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	
calcium	7440-70-2	E440	50	mg/kg	<50	
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	
copper	7440-50-8	E440	0.5	mg/kg	<0.50	
iron	7439-89-6	E440	50	mg/kg	<50	
lead	7439-92-1	E440	0.5	mg/kg	<0.50	
lithium	7439-93-2	E440	2	mg/kg	<2.0	
magnesium	7439-95-4	E440	20	mg/kg	<20	
manganese	7439-96-5	E440	1	mg/kg	<1.0	
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	
phosphorus	7723-14-0	E440	50	mg/kg	<50	
potassium	7440-09-7	E440	100	mg/kg	<100	
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	
silver	7440-22-4	E440	0.1	mg/kg	<0.10	
sodium	7440-23-5	E440	50	mg/kg	<50	

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nalyte	CAS Number	Method	LOR	Unit	Result	Qualifier
etals (QCLot: 695755) - continue	ed					
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	
sulfur	7704-34-9	E440	1000	mg/kg	<1000	
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	
tin	7440-31-5	E440	2	mg/kg	<2.0	
titanium	7440-32-6	E440	1	mg/kg	<1.0	
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	
zinc	7440-66-6	E440	2	mg/kg	<2.0	
zirconium	7440-67-7	E440	1	mg/kg	<1.0	
olycyclic Aromatic Hydrocarbons	(QCLot: 698656)					1
acenaphthene	83-32-9	E641A	0.05	mg/kg	<0.050	
acenaphthylene	208-96-8	E641A	0.05	mg/kg	<0.050	
acridine	260-94-6	E641A	0.05	mg/kg	<0.050	
anthracene	120-12-7	E641A	0.05	mg/kg	<0.050	
benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	<0.050	
benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	<0.050	
benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	<0.050	
benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	<0.050	
benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	<0.050	
chrysene	218-01-9	E641A	0.05	mg/kg	<0.050	
dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	<0.050	
fluoranthene	206-44-0	E641A	0.05	mg/kg	<0.050	
fluorene	86-73-7	E641A	0.05	mg/kg	<0.050	
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	<0.050	
methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	<0.030	
methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	<0.030	
naphthalene	91-20-3	E641A	0.01	mg/kg	<0.010	
phenanthrene	85-01-8	E641A	0.05	mg/kg	<0.050	
pyrene	129-00-0	E641A	0.05	mg/kg	<0.050	
quinoline	91-22-5	E641A	0.05	mg/kg	<0.050	
changeable & Adsorbed Metals	(QCLot: 695314)					I
aluminum, leachable	7429-90-5	E450	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450	0.05	mg/kg	<0.050	

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Analyte	CAS Number Method	LOR	Unit	Result	Qualifier
xchangeable & Adsorbed Metals	(QCLot: 695314) - continued				
barium, leachable	7440-39-3 E450	0.5	mg/kg	# 0.63	В
beryllium, leachable	7440-41-7 E450	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9 E450	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9 E450	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2 E450	50	mg/kg	<50	
chromium, leachable	7440-47-3 E450	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4 E450	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8 E450	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6 E450	50	mg/kg	<50	
lead, leachable	7439-92-1 E450	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2 E450	5	mg/kg	<5.0	
manganese, leachable	7439-96-5 E450	1	mg/kg	<1.0	
molybdenum, leachable	7439-98-7 E450	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0 E450	0.5	mg/kg	<0.50	
phosphorus, leachable	7723-14-0 E450	50	mg/kg	<50	
potassium, leachable	7440-09-7 E450	100	mg/kg	<100	
selenium, leachable	7782-49-2 E450	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4 E450	0.1	mg/kg	<0.10	
sodium, leachable	7440-23-5 E450	100	mg/kg	<100	
strontium, leachable	7440-24-6 E450	0.5	mg/kg	<0.50	
thallium, leachable	7440-28-0 E450	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5 E450	2	mg/kg	<2.0	
titanium, leachable	7440-32-6 E450	1	mg/kg	<1.0	
uranium, leachable	7440-61-1 E450	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2 E450	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6 E450	1	mg/kg	<1.0	
arbonate Metals (QCLot: 697168)					
aluminum, leachable	7429-90-5 E450A	50	mg/kg	<50	
antimony, leachable	7440-36-0 E450A	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2 E450A	0.05	mg/kg	<0.050	
barium, leachable	7440-39-3 E450A	2	mg/kg	<2.0	
beryllium, leachable	7440-41-7 E450A	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9 E450A	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9 E450A	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2 E450A	50	mg/kg	<50	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Carbonate Metals (QCLot: 697168)	- continued					
chromium, leachable	7440-47-3	E450A	5	mg/kg	<5.0	
cobalt, leachable	7440-48-4	E450A	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450A	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450A	50	mg/kg	<50	
lead, leachable	7439-92-1	E450A	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450A	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450A	5	mg/kg	<5.0	
molybdenum, leachable	7439-98-7	E450A	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450A	2	mg/kg	<2.0	
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	<50	
selenium, leachable	7782-49-2	E450A	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450A	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450A	5	mg/kg	<5.0	
thallium, leachable	7440-28-0	E450A	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450A	2	mg/kg	<2.0	
titanium, leachable	7440-32-6	E450A	5	mg/kg	<5.0	
uranium, leachable	7440-61-1	E450A	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450A	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450A	1	mg/kg	<1.0	
asily Reducible Metals and Iron O	xides (QCLot: 697833)					
aluminum, leachable	7429-90-5	E450B	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450B	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450B	0.05	mg/kg	<0.050	
barium, leachable	7440-39-3	E450B	0.5	mg/kg	<0.50	
beryllium, leachable	7440-41-7	E450B	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9	E450B	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450B	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450B	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450B	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4	E450B	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450B	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450B	50	mg/kg	<50	
lead, leachable	7439-92-1	E450B	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450B	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450B	1	mg/kg	<1.0	

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Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
asily Reducible Metals and Iron O	xides (QCLot: 697833) - c	ontinued				
molybdenum, leachable	7439-98-7	E450B	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450B	0.5	mg/kg	<0.50	
phosphorus, leachable	7723-14-0	E450B	50	mg/kg	<50	
selenium, leachable	7782-49-2	E450B	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450B	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450B	0.5	mg/kg	<0.50	
thallium, leachable	7440-28-0	E450B	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450B	2	mg/kg	<2.0	
titanium, leachable	7440-32-6	E450B	1	mg/kg	<1.0	
uranium, leachable	7440-61-1	E450B	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450B	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450B	1	mg/kg	<1.0	
rganic Bound Metals (QCLot: 702	2272)					
aluminum, leachable	7429-90-5	E450C	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450C	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450C	0.05	mg/kg	<0.050	
barium, leachable	7440-39-3	E450C	0.5	mg/kg	<0.50	
beryllium, leachable	7440-41-7	E450C	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9	E450C	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450C	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450C	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450C	0.5	mg/kg	<0.50	
cobalt, leachable	7440-48-4	E450C	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450C	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450C	50	mg/kg	<50	
lead, leachable	7439-92-1	E450C	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450C	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450C	1	mg/kg	<1.0	
molybdenum, leachable	7439-98-7	E450C	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450C	0.5	mg/kg	<0.50	
selenium, leachable	7782-49-2	E450C	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450C	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450C	0.5	mg/kg	<0.50	
thallium, leachable	7440-28-0	E450C	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450C	2	mg/kg	<2.0	

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Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	 LOR	Unit	Result	Qualifier
Organic Bound Metals (QCLot: 7	702272) - continued					
titanium, leachable	7440-32-6	E450C	1	mg/kg	<1.0	
uranium, leachable	7440-61-1	E450C	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450C	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450C	1	mg/kg	<1.0	
Residual Metals (QCLot: 704532))					
aluminum, leachable	7429-90-5	E450D	50	mg/kg	<50	
antimony, leachable	7440-36-0	E450D	0.1	mg/kg	<0.10	
arsenic, leachable	7440-38-2	E450D	0.5	mg/kg	<0.50	
barium, leachable	7440-39-3	E450D	2	mg/kg	<2.0	
beryllium, leachable	7440-41-7	E450D	0.2	mg/kg	<0.20	
bismuth, leachable	7440-69-9	E450D	0.2	mg/kg	<0.20	
cadmium, leachable	7440-43-9	E450D	0.05	mg/kg	<0.050	
calcium, leachable	7440-70-2	E450D	50	mg/kg	<50	
chromium, leachable	7440-47-3	E450D	5	mg/kg	<5.0	
cobalt, leachable	7440-48-4	E450D	0.1	mg/kg	<0.10	
copper, leachable	7440-50-8	E450D	0.5	mg/kg	<0.50	
iron, leachable	7439-89-6	E450D	50	mg/kg	<50	
lead, leachable	7439-92-1	E450D	0.5	mg/kg	<0.50	
lithium, leachable	7439-93-2	E450D	5	mg/kg	<5.0	
manganese, leachable	7439-96-5	E450D	5	mg/kg	<5.0	
molybdenum, leachable	7439-98-7	E450D	0.5	mg/kg	<0.50	
nickel, leachable	7440-02-0	E450D	2	mg/kg	<2.0	
selenium, leachable	7782-49-2	E450D	0.2	mg/kg	<0.20	
silver, leachable	7440-22-4	E450D	0.1	mg/kg	<0.10	
strontium, leachable	7440-24-6	E450D	5	mg/kg	<5.0	
thallium, leachable	7440-28-0	E450D	0.05	mg/kg	<0.050	
tin, leachable	7440-31-5	E450D	2	mg/kg	<2.0	
titanium, leachable	7440-32-6	E450D	5	mg/kg	<5.0	
uranium, leachable	7440-61-1	E450D	0.05	mg/kg	<0.050	
vanadium, leachable	7440-62-2	E450D	0.2	mg/kg	<0.20	
zinc, leachable	7440-66-6	E450D	1	mg/kg	<1.0	

Qualifiers

Qualifier Description

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Laboratory Control Sample (LCS) Report

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

Sub-Matrix: Soil/Solid						Laboratory Con	trol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number M	lethod	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 696197)									
pH (1:2 soil:water)	E	108		pH units	7 pH units	100	97.0	103	
Physical Tests (QCLot: 698658)									•
moisture	E	144	0.25	%	50 %	97.0	90.0	110	
Organic / Inorganic Carbon (QCLot: 685726)									
carbon, inorganic [IC]	E	354	0.05	%	0.5 %	110	90.0	110	
Organic / Inorganic Carbon (QCLot: 686559)									
carbon, total [TC]	E	351	0.05	%	48 %	99.9	90.0	110	
Metals (QCLot: 695754)									
mercury	7439-97-6 E	510	0.005	mg/kg	0.1 mg/kg	107	80.0	120	
Metals (QCLot: 695755)									
aluminum	7429-90-5 E		50	mg/kg	200 mg/kg	101	80.0	120	
antimony	7440-36-0 E		0.1	mg/kg	100 mg/kg	95.2	80.0	120	
arsenic	7440-38-2 E		0.1	mg/kg	100 mg/kg	96.5	80.0	120	
barium	7440-39-3 E	440	0.5	mg/kg	25 mg/kg	95.9	80.0	120	
beryllium	7440-41-7 E	440	0.1	mg/kg	10 mg/kg	89.7	80.0	120	
bismuth	7440-69-9 E	440	0.2	mg/kg	100 mg/kg	92.2	80.0	120	
boron	7440-42-8 E	440	5	mg/kg	100 mg/kg	90.6	80.0	120	
cadmium	7440-43-9 E	440	0.02	mg/kg	10 mg/kg	95.5	80.0	120	
calcium	7440-70-2 E	440	50	mg/kg	5000 mg/kg	88.5	80.0	120	
chromium	7440-47-3 E	440	0.5	mg/kg	25 mg/kg	94.5	80.0	120	
cobalt	7440-48-4 E	440	0.1	mg/kg	25 mg/kg	94.7	80.0	120	
copper	7440-50-8 E	440	0.5	mg/kg	25 mg/kg	94.2	80.0	120	
iron	7439-89-6 E	440	50	mg/kg	100 mg/kg	106	80.0	120	
lead	7439-92-1 E	440	0.5	mg/kg	50 mg/kg	95.4	80.0	120	
lithium	7439-93-2 E	440	2	mg/kg	25 mg/kg	97.5	80.0	120	
magnesium	7439-95-4 E	440	20	mg/kg	5000 mg/kg	101	80.0	120	
manganese	7439-96-5 E	440	1	mg/kg	25 mg/kg	98.5	80.0	120	
molybdenum	7439-98-7 E	440	0.1	mg/kg	25 mg/kg	93.5	80.0	120	
nickel	7440-02-0 E	440	0.5	mg/kg	50 mg/kg	93.1	80.0	120	
phosphorus	7723-14-0 E	440	50	mg/kg	1000 mg/kg	96.3	80.0	120	
potassium	7440-09-7 E	440	100	mg/kg	5000 mg/kg	98.2	80.0	120	

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Sub-Matrix: Soil/Solid						Laboratory Cor	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifie
Metals (QCLot: 695755) - continued									
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	95.4	80.0	120	
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	89.8	80.0	120	
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	100	80.0	120	
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	96.9	80.0	120	
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	82.5	80.0	120	
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	96.7	80.0	120	
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	96.6	80.0	120	
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	95.8	80.0	120	
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	111	80.0	120	
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	98.8	80.0	120	
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	95.3	80.0	120	
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	96.2	80.0	120	
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	93.7	80.0	120	
Polycyclic Aromatic Hydrocarbons	(QCLot: 698656)								
acenaphthene	83-32-9	E641A	0.05	mg/kg	0.5 mg/kg	112	60.0	130	
acenaphthylene	208-96-8	E641A	0.05	mg/kg	0.5 mg/kg	109	60.0	130	
acridine	260-94-6	E641A	0.05	mg/kg	0.5 mg/kg	104	60.0	130	
anthracene	120-12-7	E641A	0.05	mg/kg	0.5 mg/kg	106	60.0	130	
penz(a)anthracene	56-55-3	E641A	0.05	mg/kg	0.5 mg/kg	97.1	60.0	130	
benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	0.5 mg/kg	107	60.0	130	
benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	0.5 mg/kg	114	60.0	130	
benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	0.5 mg/kg	106	60.0	130	
benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	0.5 mg/kg	118	60.0	130	
chrysene	218-01-9	E641A	0.05	mg/kg	0.5 mg/kg	118	60.0	130	
dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	0.5 mg/kg	97.0	60.0	130	
fluoranthene	206-44-0	E641A	0.05	mg/kg	0.5 mg/kg	112	60.0	130	
luorene	86-73-7	E641A	0.05	mg/kg	0.5 mg/kg	109	60.0	130	
ndeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	0.5 mg/kg	100	60.0	130	
methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	0.5 mg/kg	118	60.0	130	
nethylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	0.5 mg/kg	113	60.0	130	
naphthalene	91-20-3	E641A	0.01	mg/kg	0.5 mg/kg	108	50.0	130	
phenanthrene	85-01-8	E641A	0.05	mg/kg	0.5 mg/kg	109	60.0	130	
pyrene	129-00-0	E641A	0.05	mg/kg	0.5 mg/kg	110	60.0	130	
quinoline		E641A	0.05	mg/kg	0.5 mg/kg	98.7	60.0	130	

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beryllium, leachable



Regional Effects Program Laboratory Control Sample (LCS) Report Sub-Matrix: Soil/Solid Spike Recovery (%) Recovery Limits (%) CAS Number Method LOR Unit Qualifier Analyte Concentration LCS Low High Exchangeable & Adsorbed Metals (QCLot: 695314) 7429-90-5 E450 70.0 130 aluminum, leachable 50 mg/kg 2 mg/kg 104 antimony, leachable 7440-36-0 E450 0.1 70.0 130 mg/kg 0.2 mg/kg 97.5 arsenic, leachable 7440-38-2 E450 0.05 mg/kg 96.4 70.0 130 0.2 mg/kg barium, leachable 7440-39-3 E450 0.5 mg/kg 0.2 mg/kg 94.0 70.0 130 7440-41-7 E450 beryllium, leachable 0.2 mg/kg 99.9 70.0 130 0.4 mg/kg bismuth, leachable 7440-69-9 E450 0.2 mg/kg 0.1 mg/kg 83.0 70.0 130 7440-43-9 E450 0.05 cadmium, leachable mg/kg 0.04 mg/kg 99.5 70.0 130 7440-70-2 E450 50 mg/kg 70.0 130 calcium, leachable 40 mg/kg 99.5 7440-47-3 E450 0.5 70.0 130 chromium, leachable mg/kg 0.4 mg/kg 98.3 cobalt, leachable 7440-48-4 E450 0.1 70.0 130 mg/kg 95.6 0.2 mg/kg 7440-50-8 E450 0.5 70.0 130 copper, leachable mg/kg 0.2 mg/kg 92.4 iron, leachable 7439-89-6 E450 50 mg/kg 98.1 70.0 130 20 mg/kg 7439-92-1 E450 0.5 70.0 130 lead, leachable mg/kg 0.2 mg/kg 87.5 lithium, leachable 7439-93-2 E450 70.0 130 mg/kg 1 mg/kg 100 7439-96-5 E450 manganese, leachable mg/kg 0.2 mg/kg 103 70.0 130 7439-98-7 E450 0.5 70.0 molybdenum, leachable mg/kg 0.2 mg/kg 101 130 nickel, leachable 7440-02-0 E450 0.5 mg/kg 0.4 mg/kg 92.8 70.0 130 7723-14-0 E450 50 70.0 phosphorus, leachable mg/kg 100 mg/kg 111 130 7440-09-7 E450 100 70.0 130 potassium, leachable mg/kg 40 mg/kg 98.5 7782-49-2 E450 0.2 70.0 selenium, leachable 130 mg/kg 0.4 mg/kg 98.6 7440-22-4 E450 0.1 70.0 130 silver, leachable mg/kg 0.04 mg/kg 102 sodium, leachable 7440-23-5 E450 100 mg/kg 20 mg/kg 103 70.0 130 7440-24-6 E450 0.5 70.0 130 strontium, leachable mg/kg 102 0.2 mg/kg thallium, leachable 7440-28-0 E450 0.05 mg/kg 88.0 70.0 130 0.04 mg/kg tin. leachable 7440-31-5 E450 70.0 130 mg/kg 0.2 mg/kg 96.0 7440-32-6 E450 titanium, leachable mg/kg 0.4 mg/kg 97.7 70.0 130 7440-61-1 E450 0.05 uranium, leachable mg/kg 0.04 mg/kg 86.8 70.0 130 7440-62-2 E450 0.2 70.0 130 vanadium, leachable mg/kg 101 1 mg/kg 7440-66-6 E450 70.0 130 zinc, leachable mg/kg 4 mg/kg 97.3 Carbonate Metals (QCLot: 697168) aluminum, leachable 7429-90-5 E450A 50 70.0 130 mg/kg 105 2 mg/kg 7440-36-0 E450A 0.1 70.0 130 antimony, leachable mg/kg 0.2 mg/kg 100 arsenic, leachable 7440-38-2 E450A 0.05 mg/kg 70.0 130 0.2 mg/kg 104 7440-39-3 E450A barium, leachable 2 mg/kg 0.2 mg/kg 102 70.0 130

0.2

mg/kg

0.4 mg/kg

100

70.0

130

7440-41-7 E450A

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Sub-Matrix: Soil/Solid						Laboratory Co.	ntrol Sample (LCS)	Report	
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Carbonate Metals (QCLot: 697168) -	continued								
bismuth, leachable	7440-69-9	E450A	0.2	mg/kg	0.1 mg/kg	86.0	70.0	130	
cadmium, leachable	7440-43-9	E450A	0.05	mg/kg	0.04 mg/kg	102	70.0	130	
calcium, leachable	7440-70-2	E450A	50	mg/kg	40 mg/kg	97.6	70.0	130	
chromium, leachable	7440-47-3	E450A	5	mg/kg	0.4 mg/kg	100	70.0	130	
cobalt, leachable	7440-48-4	E450A	0.1	mg/kg	0.2 mg/kg	100	70.0	130	
copper, leachable	7440-50-8	E450A	0.5	mg/kg	0.2 mg/kg	98.1	70.0	130	
iron, leachable	7439-89-6	E450A	50	mg/kg	20 mg/kg	97.0	70.0	130	
lead, leachable	7439-92-1	E450A	0.5	mg/kg	0.2 mg/kg	91.5	70.0	130	
lithium, leachable	7439-93-2	E450A	5	mg/kg	1 mg/kg	103	70.0	130	
manganese, leachable	7439-96-5	E450A	5	mg/kg	0.2 mg/kg	104	70.0	130	
molybdenum, leachable	7439-98-7	E450A	0.5	mg/kg	0.2 mg/kg	104	70.0	130	
nickel, leachable	7440-02-0	E450A	2	mg/kg	0.4 mg/kg	98.2	70.0	130	
phosphorus, leachable	7723-14-0	E450A	50	mg/kg	100 mg/kg	103	70.0	130	
selenium, leachable	7782-49-2	E450A	0.2	mg/kg	0.4 mg/kg	99.3	70.0	130	
silver, leachable	7440-22-4	E450A	0.1	mg/kg	0.04 mg/kg	102	70.0	130	
strontium, leachable	7440-24-6	E450A	5	mg/kg	0.2 mg/kg	105	70.0	130	
thallium, leachable	7440-28-0	E450A	0.05	mg/kg	0.04 mg/kg	91.9	70.0	130	
tin, leachable	7440-31-5	E450A	2	mg/kg	0.2 mg/kg	100	70.0	130	
titanium, leachable	7440-32-6	E450A	5	mg/kg	0.4 mg/kg	100	70.0	130	
uranium, leachable	7440-61-1	E450A	0.05	mg/kg	0.04 mg/kg	91.7	70.0	130	
vanadium, leachable	7440-62-2	E450A	0.2	mg/kg	1 mg/kg	104	70.0	130	
zinc, leachable	7440-66-6	E450A	1	mg/kg	4 mg/kg	102	70.0	130	
					3 3				
Easily Reducible Metals and Iron Oxi	ides (QCLot: 697833)								
aluminum, leachable	7429-90-5	E450B	50	mg/kg	2 mg/kg	99.9	70.0	130	
antimony, leachable	7440-36-0	E450B	0.1	mg/kg	0.2 mg/kg	100	70.0	130	
arsenic, leachable	7440-38-2	E450B	0.05	mg/kg	0.2 mg/kg	106	70.0	130	
barium, leachable	7440-39-3	E450B	0.5	mg/kg	0.2 mg/kg	97.9	70.0	130	
beryllium, leachable	7440-41-7	E450B	0.2	mg/kg	0.4 mg/kg	102	70.0	130	
bismuth, leachable	7440-69-9	E450B	0.2	mg/kg	0.1 mg/kg	91.0	70.0	130	
cadmium, leachable	7440-43-9	E450B	0.05	mg/kg	0.04 mg/kg	102	70.0	130	
calcium, leachable	7440-70-2	E450B	50	mg/kg	40 mg/kg	99.1	70.0	130	
chromium, leachable	7440-47-3	E450B	0.5	mg/kg	0.4 mg/kg	102	70.0	130	
cobalt, leachable	7440-48-4	E450B	0.1	mg/kg	0.2 mg/kg	104	70.0	130	
copper, leachable	7440-50-8	E450B	0.5	mg/kg	0.2 mg/kg	102	70.0	130	
iron, leachable	7439-89-6	E450B	50	mg/kg	20 mg/kg	101	70.0	130	
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silver, leachable



Laboratory Control Sample (LCS) Report Sub-Matrix: Soil/Solid Spike Recovery (%) Recovery Limits (%) CAS Number Method LOR Unit Qualifier Analyte Concentration LCS Low High Easily Reducible Metals and Iron Oxides (QCLot: 697833) - continued 7439-92-1 E450B 0.5 70.0 130 lead, leachable mg/kg 0.2 mg/kg 95.7 7439-93-2 E450B 70.0 130 lithium, leachable mg/kg 1 mg/kg 104 manganese, leachable 7439-96-5 E450B mg/kg 103 70.0 130 0.2 mg/kg molybdenum, leachable 7439-98-7 E450B 0.5 mg/kg 0.2 mg/kg 100 70.0 130 7440-02-0 E450B nickel, leachable 0.5 mg/kg 102 70.0 130 0.4 mg/kg phosphorus, leachable 7723-14-0 E450B 50 mg/kg 100 mg/kg 99.7 70.0 130 7782-49-2 E450B 0.2 selenium, leachable mg/kg 0.4 mg/kg 118 70.0 130 7440-22-4 E450B 0.1 mg/kg 104 70.0 130 silver, leachable 0.04 mg/kg 7440-24-6 E450B 0.5 70.0 130 strontium, leachable mg/kg 0.2 mg/kg 101 7440-28-0 E450B 0.05 70.0 130 thallium, leachable mg/kg 98.8 0.04 mg/kg 7440-31-5 E450B 2 70.0 130 tin, leachable mg/kg 0.2 mg/kg 99.5 titanium, leachable 7440-32-6 E450B mg/kg 96.7 70.0 130 0.4 mg/kg 7440-61-1 E450B 0.05 70.0 130 uranium, leachable mg/kg 0.04 mg/kg 95.0 vanadium, leachable 7440-62-2 E450B 0.2 mg/kg 70.0 130 103 1 mg/kg 7440-66-6 E450B zinc, leachable mg/kg 4 mg/kg 107 70.0 130 Organic Bound Metals (QCLot: 702272) aluminum, leachable 7429-90-5 E450C 50 70.0 130 mg/kg 2 mg/kg 104 7440-36-0 E450C 0.1 70.0 130 antimony, leachable mg/kg 0.2 mg/kg 97.6 7440-38-2 E450C arsenic, leachable 0.05 mg/kg 70.0 130 108 0.2 mg/kg barium, leachable 7440-39-3 E450C 0.5 mg/kg 70.0 130 0.2 mg/kg 101 beryllium, leachable 7440-41-7 E450C 0.2 mg/kg 0.4 mg/kg 95.0 70.0 130 7440-69-9 E450C 0.2 mg/kg 70.0 130 bismuth, leachable 0.1 mg/kg 95.9 7440-43-9 E450C 0.05 cadmium, leachable mg/kg 0.04 mg/kg 102 70.0 130 7440-70-2 E450C 50 calcium, leachable mg/kg 93.0 70.0 130 40 mg/kg chromium, leachable 7440-47-3 E450C 0.5 mg/kg 0.4 mg/kg 100 70.0 130 7440-48-4 E450C 0.1 70.0 130 cobalt, leachable mg/kg 0.2 mg/kg 101 7440-50-8 E450C 0.5 mg/kg 70.0 130 copper, leachable 0.2 mg/kg 102 7439-89-6 E450C 50 70.0 130 iron, leachable mg/kg 20 mg/kg 98.3 7439-92-1 E450C 0.5 mg/kg 98.2 70.0 130 lead, leachable 0.2 mg/kg 7439-93-2 E450C 70.0 130 lithium, leachable mg/kg 1 mg/kg 94.9 manganese, leachable 7439-96-5 E450C mg/kg 100 70.0 130 0.2 mg/kg 7439-98-7 E450C 0.5 70.0 130 molybdenum, leachable mg/kg 0.2 mg/kg 98.2 nickel, leachable 7440-02-0 E450C 0.5 mg/kg 70.0 130 0.4 mg/kg 101 7782-49-2 E450C selenium, leachable 0.2 mg/kg 0.4 mg/kg 106 70.0 130

0.1

mg/kg

0.04 mg/kg

104

70.0

130

7440-22-4 E450C

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Laboratory Control Sample (LCS) Report Sub-Matrix: Soil/Solid Spike Recovery (%) Recovery Limits (%) CAS Number Method LOR Unit Qualifier Analyte Concentration LCS Low High Organic Bound Metals (QCLot: 702272) - continued 7440-24-6 E450C 0.5 70.0 130 strontium, leachable mg/kg 0.2 mg/kg 99.7 7440-28-0 E450C 0.05 70.0 130 thallium, leachable mg/kg 0.04 mg/kg 97.1 tin, leachable 7440-31-5 E450C mg/kg 0.2 mg/kg 97.0 70.0 130 titanium, leachable 7440-32-6 E450C mg/kg 0.4 mg/kg 99.4 70.0 130 7440-61-1 E450C 0.05 uranium, leachable mg/kg 97.1 70.0 130 0.04 mg/kg 7440-62-2 E450C 0.2 vanadium, leachable mg/kg 1 mg/kg 100 70.0 130 7440-66-6 E450C zinc, leachable mg/kg 4 mg/kg 103 70.0 130 Residual Metals (QCLot: 704532) 7429-90-5 E450D aluminum, leachable 50 mg/kg 98.3 70.0 130 2 mg/kg 7440-36-0 E450D 0.1 70.0 130 mg/kg 103 antimony, leachable 0.2 mg/kg arsenic, leachable 7440-38-2 E450D 0.5 mg/kg 0.2 mg/kg 97.9 70.0 130 barium, leachable 7440-39-3 E450D 2 mg/kg 70.0 130 0.2 mg/kg 97.5 beryllium, leachable 7440-41-7 E450D 0.2 mg/kg 0.4 mg/kg 99.7 70.0 130 7440-69-9 E450D 0.2 70.0 bismuth, leachable mg/kg 0.1 mg/kg 97.1 130 7440-43-9 E450D 0.05 70.0 130 cadmium, leachable mg/kg 0.04 mg/kg 98.4 50 calcium, leachable 7440-70-2 E450D mg/kg 40 mg/kg 102 70.0 130 7440-47-3 E450D 70.0 130 chromium, leachable mg/kg 98.4 0.4 mg/kg 7440-48-4 E450D cobalt, leachable 0.1 mg/kg 70.0 130 0.2 mg/kg 99.3 7440-50-8 E450D 0.5 copper, leachable mg/kg 70.0 130 98.1 0.2 mg/kg iron, leachable 7439-89-6 E450D 50 mg/kg 99.6 70.0 130 20 mg/kg lead, leachable 7439-92-1 E450D 0.5 mg/kg 0.2 mg/kg 99.1 70.0 130 7439-93-2 E450D mg/kg 70.0 130 lithium, leachable 1 mg/kg 103 7439-96-5 E450D 70.0 manganese, leachable mg/kg 0.2 mg/kg 101 130 7439-98-7 E450D 0.5 molybdenum, leachable mg/kg 95.2 70.0 130 0.2 mg/kg nickel, leachable 7440-02-0 E450D 2 mg/kg 0.4 mg/kg 99.6 70.0 130 7782-49-2 E450D 0.2 70.0 130 selenium, leachable mg/kg 0.4 mg/kg 98.7 7440-22-4 E450D 0.1 mg/kg 102 70.0 130 silver, leachable 0.04 mg/kg 7440-24-6 E450D 5 70.0 130 strontium, leachable mg/kg 0.2 mg/kg 98.6 7440-28-0 E450D 0.05 mg/kg 101 70.0 130 thallium, leachable 0.04 mg/kg 7440-31-5 E450D 2 70.0 130 tin. leachable mg/kg 0.2 mg/kg 97.0 titanium, leachable 7440-32-6 E450D mg/kg 97.8 70.0 130 0.4 mg/kg 7440-61-1 E450D 0.05 70.0 130 uranium, leachable mg/kg 0.04 mg/kg 99.2 vanadium, leachable 7440-62-2 E450D 0.2 mg/kg 70.0 130 99.7 1 mg/kg 7440-66-6 E450D zinc, leachable mg/kg 4 mg/kg 101 70.0 130

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Matrix Spike (MS) Report

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

dub-Matrix: Soil/Solid							Matrix Spik	re (MS) Report		
					Spi	ke	Recovery (%)	Recovery	Limits (%)	
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
	atic Hydrocarbons (QCL	ot: 698656)								
CG2213623-001	RG_GAUT_SE-1_2022-09-1	acenaphthene	83-32-9	E641A	0.401 mg/kg	0.5 mg/kg	106	50.0	140	
	4_N	acenaphthylene	208-96-8	E641A	0.384 mg/kg	0.5 mg/kg	102	50.0	140	
		acridine	260-94-6	E641A	0.396 mg/kg	0.5 mg/kg	104	50.0	140	
		anthracene	120-12-7	E641A	0.424 mg/kg	0.5 mg/kg	112	50.0	140	
		benz(a)anthracene	56-55-3	E641A	0.392 mg/kg	0.5 mg/kg	104	50.0	140	
		benzo(a)pyrene	50-32-8	E641A	0.383 mg/kg	0.5 mg/kg	101	50.0	140	
		benzo(b+j)fluoranthene	n/a	E641A	0.420 mg/kg	0.5 mg/kg	111	50.0	140	
		benzo(g,h,i)perylene	191-24-2	E641A	0.362 mg/kg	0.5 mg/kg	95.8	50.0	140	
		benzo(k)fluoranthene	207-08-9	E641A	0.390 mg/kg	0.5 mg/kg	103	50.0	140	
		chrysene	218-01-9	E641A	0.395 mg/kg	0.5 mg/kg	104	50.0	140	
		dibenz(a,h)anthracene	53-70-3	E641A	0.349 mg/kg	0.5 mg/kg	92.3	50.0	140	
		fluoranthene	206-44-0	E641A	0.418 mg/kg	0.5 mg/kg	111	50.0	140	
		fluorene	86-73-7	E641A	0.395 mg/kg	0.5 mg/kg	104	50.0	140	
		indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.355 mg/kg	0.5 mg/kg	93.8	50.0	140	
		methylnaphthalene, 1-	90-12-0	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		methylnaphthalene, 2-	91-57-6	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		naphthalene	91-20-3	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		phenanthrene	85-01-8	E641A	ND mg/kg	0.5 mg/kg	ND	50.0	140	
		pyrene	129-00-0	E641A	0.423 mg/kg	0.5 mg/kg	112	50.0	140	
		quinoline	91-22-5	E641A	0.328 mg/kg	0.5 mg/kg	86.8	50.0	140	

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Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

ub-Matrix:					Refere	nce Material (RM) Re	port		
					RM Target	Recovery (%)	Recovery L	imits (%)	
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 696197)								
	RM	pH (1:2 soil:water)		E108	8.06 pH units	99.9	96.0	104	
Organic / Inorga	nic Carbon (QCLot: 685	5726)							
	RM	carbon, inorganic [IC]		E354	0.383 %	118	80.0	120	
Organic / Inorga	nic Carbon (QCLot: 686	5559)							
	RM	carbon, total [TC]		E351	1.4 %	101	80.0	120	
Metals (QCLot: 6	95754)								
	RM	mercury	7439-97-6	E510	0.062 mg/kg	106	70.0	130	
Metals (QCLot: 6	<u> </u>								
	RM	aluminum	7429-90-5	E440	9817 mg/kg	99.3	70.0	130	
	RM	antimony	7440-36-0	E440	3.99 mg/kg	104	70.0	130	
	RM	arsenic	7440-38-2	E440	3.73 mg/kg	91.1	70.0	130	
	RM	barium	7440-39-3	E440	105 mg/kg	102	70.0	130	
	RM	beryllium	7440-41-7	E440	0.349 mg/kg	102	70.0	130	
	RM	boron	7440-42-8	E440	8.5 mg/kg	111	40.0	160	
	RM	cadmium	7440-43-9	E440	0.91 mg/kg	97.5	70.0	130	
	RM	calcium	7440-70-2	E440	31082 mg/kg	92.5	70.0	130	
	RM	chromium	7440-47-3	E440	101 mg/kg	96.8	70.0	130	
	RM	cobalt	7440-48-4	E440	6.9 mg/kg	97.0	70.0	130	
	RM	copper	7440-50-8	E440	123 mg/kg	97.5	70.0	130	
	RM	iron	7439-89-6	E440	23558 mg/kg	95.7	70.0	130	
	RM	lead	7439-92-1	E440	267 mg/kg	104	70.0	130	
	RM	lithium	7439-93-2	E440	9.5 mg/kg	101	70.0	130	
	RM	magnesium	7439-95-4	E440	5509 mg/kg	103	70.0	130	
	RM	manganese	7439-96-5	E440	269 mg/kg	100	70.0	130	
	RM	molybdenum	7439-98-7	E440	1.03 mg/kg	97.4	70.0	130	
	RM	nickel	7440-02-0	E440	26.7 mg/kg	97.3	70.0	130	
	RM	phosphorus	7723-14-0	E440	752 mg/kg	101	70.0	130	
	RM	potassium	7440-09-7	E440	1587 mg/kg	94.5	70.0	130	

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Sub-Matrix:						Refere	nce Material (RM) Re	port	
					RM Target	Recovery (%)	Recovery I	Limits (%)	
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot	: 695755) - continued								
·	RM	silver	7440-22-4	E440	4.06 mg/kg	92.4	70.0	130	
	RM	sodium	7440-23-5	E440	797 mg/kg	91.3	70.0	130	
	RM	strontium	7440-24-6	E440	86.1 mg/kg	97.9	70.0	130	
	RM	thallium	7440-28-0	E440	0.0786 mg/kg	108	40.0	160	
	RM	tin	7440-31-5	E440	10.6 mg/kg	99.7	70.0	130	
	RM	titanium	7440-32-6	E440	839 mg/kg	104	70.0	130	
	RM	uranium	7440-61-1	E440	0.52 mg/kg	105	70.0	130	
	RM	vanadium	7440-62-2	E440	32.7 mg/kg	97.4	70.0	130	
	RM	zinc	7440-66-6	E440	297 mg/kg	97.3	70.0	130	
	RM	zirconium	7440-67-7	E440	5.73 mg/kg	100	70.0	130	



QUALITY CONTROL INTERPRETIVE REPORT

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Client : Teck Coal Limited Laboratory : Calgary - Environmental
Contact : Giovanna Diaz Account Manager : Lyudmyla Shyets

Contact : Giovanna Diaz Account Manager : Lyudmyla Shvets
Address : 421 Pine Avenue Address : 2559 29th Street NE

Sparwood BC Canada V0B2G0 Calgary, Alberta Canada T1Y 7B5

Telephone :--- Telephone :+1 403 407 1800

 Project
 : Regional Effects Program
 Date Samples Received
 : 04-Oct-2022 09:00

 PO
 : VPO00816101
 Issue Date
 : 20-Oct-2022 18:28

C-O-C number : REP_LAEMP_GC 2022-09 ALS

Sampler : Jennifer Ings

Site · ____

Quote number : Teck Coal Master Quote

No. of samples received :6
No. of samples analysed :6

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

Key

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

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

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers: Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

No Reference Material (RM) Sample outliers occur.

Outliers: Analysis Holding Time Compliance (Breaches) ● Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

<u>No</u> Quality Control Sample Frequency Outliers occur.

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Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: Soil/Solid

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Exchangeable & Adsorbed Metals	QC-695314-001		barium, leachable	7440-39-3	E450	0.63 ^B	0.5 mg/kg	Blank result exceeds
						mg/kg		permitted value

Result Qualifiers

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.

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Analysis Holding Time Compliance

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

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

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

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

Matrix: Soil/Solid Evaluation: × = Holding time exceedance; √ = Within Holding Time

Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation			Analy	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holdin	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GAUT_SE-3_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	√
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GAUT_SE-4_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_GAUT_SE-5_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	✓
Carbonate Metals : Metals by CRC ICPMS (Tessier Extraction #2)										
Glass soil jar/Teflon lined cap RG_RIVER_SE-2_2022-09-14_N	E450A	14-Sep-2022	14-Oct-2022				15-Oct-2022	180 days	31 days	✓
Easily Reducible Metals and Iron Oxides : Metals by CRC ICPMS (Tessier Extraction	on #3)			·	•					
Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N	E450B	14-Sep-2022	15-Oct-2022				16-Oct-2022	180 days	32 days	*

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Matrix: Soil/Solid Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date **Holding Times** Eval Rec Actual Rec Actual Date Easily Reducible Metals and Iron Oxides: Metals by CRC ICPMS (Tessier Extraction #3) Glass soil jar/Teflon lined cap E450B 14-Sep-2022 15-Oct-2022 ✓ 16-Oct-2022 32 days RG GAUT SE-2 2022-09-14 N 180 days Easily Reducible Metals and Iron Oxides: Metals by CRC ICPMS (Tessier Extraction #3) Glass soil jar/Teflon lined cap RG_GAUT_SE-3_2022-09-14_N E450B 14-Sep-2022 15-Oct-2022 16-Oct-2022 32 days ✓ 180 days Easily Reducible Metals and Iron Oxides: Metals by CRC ICPMS (Tessier Extraction #3) Glass soil jar/Teflon lined cap E450B 14-Sep-2022 15-Oct-2022 16-Oct-2022 32 days ✓ RG GAUT SE-4 2022-09-14 N 180 days Easily Reducible Metals and Iron Oxides: Metals by CRC ICPMS (Tessier Extraction #3) Glass soil jar/Teflon lined cap E450B RG_GAUT_SE-5_2022-09-14_N 14-Sep-2022 15-Oct-2022 16-Oct-2022 180 32 days ✓ days Easily Reducible Metals and Iron Oxides: Metals by CRC ICPMS (Tessier Extraction #3) Glass soil jar/Teflon lined cap E450B 14-Sep-2022 15-Oct-2022 16-Oct-2022 ✓ RG RIVER SE-2 2022-09-14 N 32 days 180 days Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1) Glass soil iar/Teflon lined cap E450 ✓ RG GAUT SE-3 2022-09-14 N 14-Sep-2022 13-Oct-2022 14-Oct-2022 180 30 days ---days Exchangeable & Adsorbed Metals: Metals by CRC ICPMS (Tessier Extraction #1) Glass soil jar/Teflon lined cap RG GAUT SE-4 2022-09-14 N E450 14-Sep-2022 13-Oct-2022 14-Oct-2022 ✓ 30 days 180 days Exchangeable & Adsorbed Metals: Metals by CRC ICPMS (Tessier Extraction #1) Glass soil jar/Teflon lined cap ✓ RG GAUT SE-5 2022-09-14 N E450 14-Sep-2022 13-Oct-2022 14-Oct-2022 180 30 days days Exchangeable & Adsorbed Metals: Metals by CRC ICPMS (Tessier Extraction #1) Glass soil jar/Teflon lined cap E450 14-Sep-2022 13-Oct-2022 14-Oct-2022 31 days 1 RG_GAUT_SE-1_2022-09-14_N 180 days

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Matrix: Soil/Solid Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Method Sampling Date Extraction / Preparation Date Eval Analysis Date Holding Times Rec Actual Analysis Date Holding Times Rec Actual Analysis Date Holding Times Rec Actual Analysis Date Rec Actual Analysis Date Holding Times Rec Actual Analysis Date Analysis Date Rec Actual Analysis Date Analysis Date Rec Actual Analysis Date Anal	Eval
Date Rec Actual	· · · · · · · · · · · · · · · · · · ·
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1) Glass soil jar/Teflon lined cap	√ ×
Class soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E450 14-Sep-2022 13-Oct-2022 14-Oct-2022 180 days 31 days 31 days 31 days 31 days 31 days 31 days 31 days 32 days 32 days 32 days 32 days 32 days 33 days 34 days	√ ×
RG_GAUT_SE-2_2022-09-14_N E450	√ ×
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1) Glass soil jar/Teflon lined cap RG_RIVER_SE-2_2022-09-14_N Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	√ ×
Exchangeable & Adsorbed Metals : Metals by CRC ICPMS (Tessier Extraction #1)	×
Class soil jar/Teflon lined cap RG_RIVER_SE-2_2022-09-14_N	×
RG_RIVER_SE-2_2022-09-14_N E450 14-Sep-2022 13-Oct-2022 14-Oct-2022 180 days 31 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap Glass soil jar/Teflon lined cap	×
Metals : Mercury in Soil/Solid by CVAAS	×
Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N RE510	
Glass soil jar/Teflon lined cap RG_GAUT_SE-1_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	
RG_GAUT_SE-1_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap	
Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap	
Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	EHT
Glass soil jar/Teflon lined cap RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap Image: Control of the control of the	
RG_GAUT_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days Metals: Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap Image: Control of the control o	
Metals : Mercury in Soil/Solid by CVAAS Glass soil jar/Teflon lined cap	
Glass soil jar/Teflon lined cap	3¢
Glass soil jar/Teflon lined cap	EHT
RG_GAUT_SE-3_2022-09-14_N	
	x
	EHT
Metals : Mercury in Soil/Solid by CVAAS	
Glass soil jar/Teflon lined cap	
RG_GAUT_SE-4_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	
	EHT
Metals : Mercury in Soil/Solid by CVAAS	
Glass soil jar/Teflon lined cap	
RG_GAUT_SE-5_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	*
	EHT
Metals: Mercury in Soil/Solid by CVAAS	
Glass soil jar/Teflon lined cap	
RG_RIVER_SE-2_2022-09-14_N E510 14-Sep-2022 14-Oct-2022 14-Oct-2022 28 days 30 days	æ
Metals: Metals in Soil/Solid by CRC ICPMS	EHT
Glass soil jar/Teflon lined cap	EHT
RG_GAUT_SE-1_2022-09-14_N E440 14-Sep-2022 14-Oct-2022 14-Oct-2022 180 30 days	
days	EHT

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Matrix: Soil/Solid Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Matrix: Soil/Solid						raidation. • =	Holding time excee			riolaling riili
Analyte Group	Method	Sampling Date	Ext	traction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
RG_GAUT_SE-2_2022-09-14_N	E440	14-Sep-2022	14-Oct-2022				14-Oct-2022	180	30 days	✓
								days		
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
RG GAUT SE-3 2022-09-14 N	E440	14-Sep-2022	14-Oct-2022				14-Oct-2022	180	30 days	✓
		·						days		
Metals : Metals in Soil/Solid by CRC ICPMS								,		
Glass soil jar/Teflon lined cap				<u> </u>			<u> </u>			
RG_GAUT_SE-4_2022-09-14_N	E440	14-Sep-2022	14-Oct-2022				14-Oct-2022	180	30 days	✓
		' '						days		
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
RG GAUT SE-5 2022-09-14 N	E440	14-Sep-2022	14-Oct-2022				14-Oct-2022	180	30 days	✓
NO_GAO1_SL-3_2022-08-14_N	L++0	14-00p-2022	14-001-2022				14-001-2022	days	Jo days	•
								uays		
Metals : Metals in Soil/Solid by CRC ICPMS				T						
Glass soil jar/Teflon lined cap	E440	44.0 2000	44.0-+ 2022				44.0-4.0000		20 4	✓
RG_RIVER_SE-2_2022-09-14_N	E440	14-Sep-2022	14-Oct-2022				14-Oct-2022	180	30 days	•
								days		
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
RG_GAUT_SE-1_2022-09-14_N	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
								days		
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
RG_GAUT_SE-2_2022-09-14_N	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
								days		
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
RG_GAUT_SE-3_2022-09-14_N	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
								days		
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
· ·	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
RG_GAUT_SE-4_2022-09-14_N	L001	11 00p 2022	00-001-2022				00 001 2022	100	o dayo	

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Matrix: Soil/Solid Evaluation: ▼ = Holding time exceedance; ✓ = Within Holding Time

Matrix: Soil/Solid					E	raiuation. 🔻 –	Holding time excee	edance,	– vviunin	Holding Time
Analyte Group	Method	Sampling Date	Ext	raction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	g Times	Eval
			Date	Rec	Actual			Rec	Actual	
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
RG_GAUT_SE-5_2022-09-14_N	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
								days		
Organic / Inorganic Carbon : Total Carbon by Combustion										
LDPE bag										
RG_RIVER_SE-2_2022-09-14_N	E351	14-Sep-2022	08-Oct-2022				08-Oct-2022	180	0 days	✓
								days		
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve									
LDPE bag										
RG_GAUT_SE-1_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve									
LDPE bag										
RG_GAUT_SE-2_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard 0	Curve									
LDPE bag										
RG_GAUT_SE-3_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve									
LDPE bag										
RG_GAUT_SE-4_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard C	Curve									
LDPE bag	F054	44.0 0000					07.0 1.0000			
RG_GAUT_SE-5_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic / Inorganic Carbon : Total Inorganic Carbon by Acetic Acid pH Standard (Curve									
LDPE bag	F254	44.0 2000					07.0-4.0000			
RG_RIVER_SE-2_2022-09-14_N	E354	14-Sep-2022					07-Oct-2022			
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap	E4500	14 00= 0000	40.0-1.0000				40.0-1.0000		0.5 4	,
RG_GAUT_SE-1_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		

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Matrix: Soil/Solid Evaluation: ★ = Holding time exceedance ; ✓ = Within Holding Time

Matrix: Soil/Solid					Ev	/aluation: 🗴 =	Holding time excee	edance ;	✓ = Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	raction / Pi	eparation			Analy	sis	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holdin	g Times	Eval
			Date	Rec	Actual		-	Rec	Actual	
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap										
RG_GAUT_SE-2_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap										
RG_GAUT_SE-3_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)				•						
Glass soil jar/Teflon lined cap										
RG_GAUT_SE-4_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap										
RG_GAUT_SE-5_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		
Organic Bound Metals : Metals by CRC ICPMS (Tessier Extraction #4)										
Glass soil jar/Teflon lined cap										
RG_RIVER_SE-2_2022-09-14_N	E450C	14-Sep-2022	18-Oct-2022				19-Oct-2022	180	35 days	✓
								days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag	_,									
RG_GAUT_SE-1_2022-09-14_N	E185A	14-Sep-2022					13-Oct-2022	365		
								days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method					,					
LDPE bag	F4054	44.0					40.0.4.0055			
RG_GAUT_SE-2_2022-09-14_N	E185A	14-Sep-2022					13-Oct-2022	365		
								days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag	F4054	44.0					40.0.4.0055			
RG_GAUT_SE-3_2022-09-14_N	E185A	14-Sep-2022					13-Oct-2022	365		
				<u> </u>				days		
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag	E4054	44.0 2000					10.0 0000			
RG_GAUT_SE-4_2022-09-14_N	E185A	14-Sep-2022					13-Oct-2022	365		
								days		

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Matrix: Soil/Solid Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analysis Analyte Group Method Sampling Date Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag E185A 14-Sep-2022 13-Oct-2022 RG GAUT SE-5 2022-09-14 N 365 days Particle Size: Grain Size Report (Attachment) Pipet/Sieve Method LDPE bag RG_RIVER_SE-2_2022-09-14_N E185A 14-Sep-2022 13-Oct-2022 365 ---days **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap E144 14-Sep-2022 16-Oct-2022 RG GAUT SE-1 2022-09-14 N ----**Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap E144 RG_GAUT_SE-2_2022-09-14_N 14-Sep-2022 16-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG_GAUT_SE-3_2022-09-14_N E144 14-Sep-2022 16-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap 14-Sep-2022 RG GAUT SE-4 2022-09-14 N E144 16-Oct-2022 ------------**Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG GAUT SE-5 2022-09-14 N E144 14-Sep-2022 16-Oct-2022 **Physical Tests: Moisture Content by Gravimetry** Glass soil jar/Teflon lined cap RG RIVER SE-2 2022-09-14 N E144 14-Sep-2022 16-Oct-2022 Physical Tests : pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap 1 E108 14-Sep-2022 14-Oct-2022 14-Oct-2022 30 days 30 days RG_GAUT_SE-1_2022-09-14_N

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Matrix: Soil/Solid Evaluation: **x** = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 14-Sep-2022 14-Oct-2022 30 days 30 days ✓ RG GAUT SE-2 2022-09-14 N 14-Oct-2022 Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap RG_GAUT_SE-3_2022-09-14_N E108 14-Sep-2022 14-Oct-2022 14-Oct-2022 30 days 30 days ✓ Physical Tests: pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 14-Sep-2022 14-Oct-2022 14-Oct-2022 30 days 30 days ✓ RG GAUT SE-4 2022-09-14 N ----Physical Tests : pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap ✓ RG_GAUT_SE-5_2022-09-14_N E108 14-Sep-2022 14-Oct-2022 14-Oct-2022 30 days 30 days Physical Tests : pH by Meter (1:2 Soil:Water Extraction) Glass soil jar/Teflon lined cap E108 14-Sep-2022 14-Oct-2022 14-Oct-2022 30 days 30 days ✓ RG RIVER SE-2 2022-09-14 N Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil iar/Teflon lined cap ✓ RG GAUT SE-1 2022-09-14 N E641A 14-Sep-2022 16-Oct-2022 14 32 × 17-Oct-2022 40 days 1 days **EHTR** days days Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap RG GAUT SE-2 2022-09-14 N E641A 14-Sep-2022 16-Oct-2022 æ 17-Oct-2022 40 days ✓ 1 days 14 32 **EHTR** days davs Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap ✓ RG GAUT SE-3 2022-09-14 N E641A 14-Sep-2022 16-Oct-2022 × 17-Oct-2022 40 days 1 days 14 32 **EHTR** days days Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap E641A 14-Sep-2022 16-Oct-2022 × 17-Oct-2022 40 days 1 days ✓ RG_GAUT_SE-4_2022-09-14_N 14 32 **EHTR** days days

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Matrix: Soil/Solid Evaluation: x = Holding time exceedance; ✓ = Within Holding Time Extraction / Preparation Analyte Group Method Sampling Date Analysis Container / Client Sample ID(s) Preparation **Holding Times** Eval Analysis Date Holding Times Eval Rec Actual Rec Actual Date Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap E641A 14-Sep-2022 16-Oct-2022 ✓ RG GAUT SE-5 2022-09-14 N × 17-Oct-2022 40 days 1 days 14 32 **EHTR** days days Polycyclic Aromatic Hydrocarbons: PAHs by Hex:Ace GC-MS Glass soil jar/Teflon lined cap RG_RIVER_SE-2_2022-09-14_N E641A 14-Sep-2022 16-Oct-2022 32 æ 17-Oct-2022 40 days 1 days ✓ 14 **EHTR** days days Residual Metals: Metals by CRC ICPMS (Tessier Extraction RM) Glass soil jar/Teflon lined cap E450D 14-Sep-2022 19-Oct-2022 20-Oct-2022 36 days ✓ RG GAUT SE-1 2022-09-14 N ----180 days Residual Metals: Metals by CRC ICPMS (Tessier Extraction RM) Glass soil jar/Teflon lined cap E450D RG_GAUT_SE-2_2022-09-14_N 14-Sep-2022 19-Oct-2022 20-Oct-2022 180 36 days ✓ days Residual Metals: Metals by CRC ICPMS (Tessier Extraction RM) Glass soil jar/Teflon lined cap E450D 14-Sep-2022 19-Oct-2022 20-Oct-2022 ✓ RG GAUT SE-3 2022-09-14 N 36 days 180 days Residual Metals: Metals by CRC ICPMS (Tessier Extraction RM) Glass soil iar/Teflon lined cap E450D 14-Sep-2022 ✓ RG GAUT SE-4 2022-09-14 N 19-Oct-2022 20-Oct-2022 180 36 days ---days Residual Metals : Metals by CRC ICPMS (Tessier Extraction RM) Glass soil jar/Teflon lined cap RG GAUT SE-5 2022-09-14 N E450D 14-Sep-2022 19-Oct-2022 20-Oct-2022 ✓ 36 days 180 days Residual Metals: Metals by CRC ICPMS (Tessier Extraction RM) Glass soil jar/Teflon lined cap ✓ RG RIVER SE-2 2022-09-14 N E450D 14-Sep-2022 19-Oct-2022 20-Oct-2022 180 36 days

Legend & Qualifier Definitions

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

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

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Quality Control Parameter Frequency Compliance

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

Matrix: Soil/Solid			ion: × = QC frequ		I		
Quality Control Sample Type	Matterd	001-4#	QC	ount	A - 4 1	Frequency (%)) Evaluation
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Mercury in Soil/Solid by CVAAS	E510	695754	1	20	5.0	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	695755	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	698658	1	6	16.6	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	698656	1	6	16.6	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	696197	1	20	5.0	5.0	✓
Total Carbon by Combustion	E351	686559	1	16	6.2	5.0	✓
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	685726	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Soil/Solid by CVAAS	E510	695754	2	20	10.0	10.0	1
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	1
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	1
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	1
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	1
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	1
Metals in Soil/Solid by CRC ICPMS	E440	695755	2	20	10.0	10.0	1
Moisture Content by Gravimetry	E144	698658	1	6	16.6	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	698656	1	6	16.6	5.0	1
pH by Meter (1:2 Soil:Water Extraction)	E108	696197	2	20	10.0	10.0	1
Total Carbon by Combustion	E351	686559	2	16	12.5	10.0	1
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354	685726	2	20	10.0	10.0	1
Method Blanks (MB)							
Mercury in Soil/Solid by CVAAS	E510	695754	1	20	5.0	5.0	1
Metals by CRC ICPMS (Tessier Extraction #1)	E450	695314	1	12	8.3	5.0	<u>√</u>
Metals by CRC ICPMS (Tessier Extraction #2)	E450A	697168	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction #3)	E450B	697833	1	12	8.3	5.0	√
Metals by CRC ICPMS (Tessier Extraction #4)	E450C	702272	1	12	8.3	5.0	✓
Metals by CRC ICPMS (Tessier Extraction RM)	E450D	704532	1	12	8.3	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	695755	1	20	5.0	5.0	√
Moisture Content by Gravimetry	E144	698658	1	6	16.6	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	698656	1	6	16.6	5.0	✓

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 CG2213623

 Client
 :
 Teck Coal Limited

Matrix Spikes (MS)
PAHs by Hex:Ace GC-MS

Project : Regional Effects Program



Matrix: Soil/Solid Evaluation: **x** = QC frequency outside specification; ✓ = QC frequency within specification. Quality Control Sample Type Count Frequency (%) Analytical Methods Method QC Lot # QC Regular Actual Expected Evaluation Method Blanks (MB) - Continued Total Carbon by Combustion 686559 16 1 6.2 5.0 E351 Total Inorganic Carbon by Acetic Acid pH Standard Curve 685726 1 20 5.0 5.0 E354

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Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Calgary - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60°C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 Calgary - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Grain Size Report (Attachment) Pipet/Sieve Method	E185A Saskatoon - Environmental	Soil/Solid	SSIR-51 Method 3.2.1	A grain size curve is a graphical representation of the particle sizing of a sample representing the percent passing against the effective particle size.
Total Carbon by Combustion	E351 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2 (mod)	Total Carbon is determined by the high temperature combustion method with measurement by an infrared detector.
Total Inorganic Carbon by Acetic Acid pH Standard Curve	E354 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 20.2	Total Inorganic Carbon is determined by acetic acid pH standard curve, where a known quantity of acetic acid is consumed by reaction with carbonates in the soil. The pH of the resulting solution is measured and compared against a standard curve relating pH to weight of carbonate.
Metals in Soil/Solid by CRC ICPMS	E440 Calgary - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCI. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Ti, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #1)	E450 Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision/Reaction Cell ICPMS. Note: For Extraction #1, the extraction solution is 1M Magnesium Chloride and is intended to extract the "Exchangeable and Adsorbed" metals.
Metals by CRC ICPMS (Tessier Extraction #2)	E450A Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by collision cell ICPMS. Note: For Extraction #2, the extraction solution is 1M Sodium Acetate adjusted to pH 5 and is intended to extract the "Carbonate" metals.
Metals by CRC ICPMS (Tessier Extraction #3)	E450B Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS.Note: For Extraction #3, the extraction solution is 0.1 M Hydroxylamine Hydro- Chloride in 25% v/v Acetic Acid and is intended to extract the □Easily Reducible Metals and Iron Oxides□.

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Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (Tessier Extraction #4)	E450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the □Organic Bound□ metals.
Metals by CRC ICPMS (Tessier Extraction RM)	E450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B (mod)	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
Mercury in Soil/Solid by CVAAS	E510 Calgary - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.
PAHs by Hex:Ace GC-MS	E641A Calgary - Environmental	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.
Particle Size Analysis (Pipette) - Wentworth Classification	EC184A Saskatoon - Environmental	Soil/Solid	Modified Wentworth	The particle size determination is performed by various methods to generate a Grain Size curve. The data from the curve is then used to produce particle size ranges based on the Modified Wentworth Classification system.
Total Organic Carbon (Calculated) in soil	EC356 Saskatoon - Environmental	Soil/Solid	CSSS (2008) 21.2	Total Organic Carbon (TOC) is calculated by the difference between total carbon (TC) and total inorganic carbon (TIC).
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Calgary - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.

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Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCI. This method is intended to liberate metals that may be environmentally available.
	Calgary - Environmental			
Extraction of Metals for CRC ICPMS (Tessier - EA)	EP450 Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the
				sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision/Reaction Cell ICPMS. Note: For Extraction #1, the extraction solution is 1M Magnesium Chloride and is intended to extract the "Exchangeable and Adsorbed" metals.
Extraction of Metals for CRC ICPMS (Tessier - CM)	EP450A Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by collision cell ICPMS. Note: For Extraction #2, the extraction solution is 1M Sodium Acetate adjusted to pH 5 and is intended to extract the "Carbonate" metals.
Extraction of Metals for CRC ICPMS (Tessier-FEO)	EP450B Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS.Note: For Extraction #3, the extraction solution is 0.1 M Hydroxylamine Hydro- Chloride in 25% v/v Acetic Acid and is intended to extract the □Easily Reducible Metals and Iron Oxides□.

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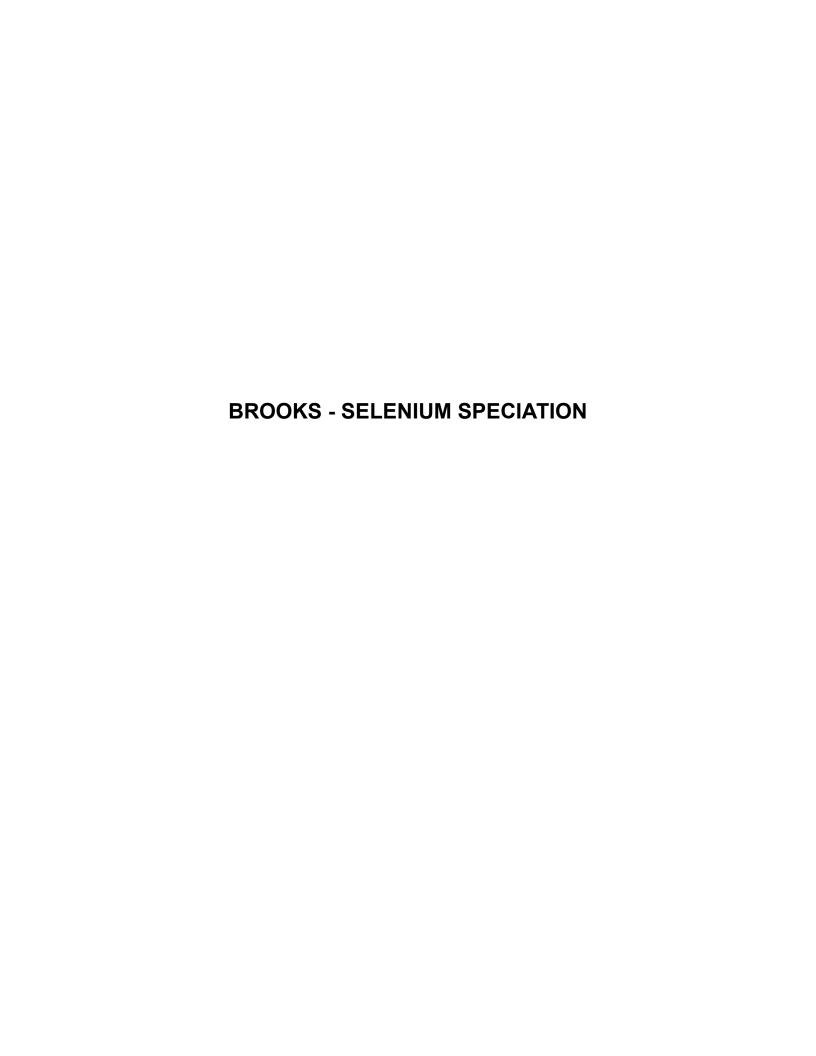
Client : Teck Coal Limited
Project : Regional Effects Program



Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Extraction of Metals for CRC ICPMS (Tessier - OB)	EP450C Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with 5 or 6 (if a pre-liminary water extraction is included) different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by Collision Reaction Cell ICPMS. Note: For Extraction #4, the extraction solution is 0.02 M Nitric Acid followed by 3.2M Ammonium Acetate and is intended to extract the □Organic Bound□ metals.
Extraction of Metals for CRC ICPMS (Tessier - RM)	EP450D Vancouver - Environmental	Soil/Solid	Tessier Extraction 1979/EPA 6020B	"This analysis is modified from the extraction procedure outlined in the "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals" Analytical Chemistry, (A. Tessier, P.G.C. Campbell, and M. Bisson, June 1979). Initially, the sample is manually homogenized, dried at <60 degrees Celsius, sieved through a 2 mm (10 mesh) sieve (this sieve step is omitted for international soil samples), and a representative subsample of the dry material is weighed for extraction. In summary, the sample is sequentially extracted with up to 6 different extraction solutions. The extract is then centrifuged for 30 minutes and the supernatant is subsequently removed and analysed. Instrumental analysis of the digested extract is by CRC ICPMS. Note: For the Tessier "RM" Extraction, the extraction solution is 50/50 mix of 1:1 Nitric Acid along with 1:1 Hydrochloric Acid, and is hot block digested as per the BC SALM procedure. This is intended to extract the □Residual□ metals.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 Calgary - Environmental	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.
Dry and Grind in Soil/Solid <60°C	EPP442 Saskatoon - Environmental	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	After removal of any coarse fragments and reservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size reduced with an automated crusher or mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

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18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

March 31, 2022

Confidential

Teck Resources Limited - Vancouver Giovanna Diaz 421 Pine Avenue Sparwood, B.C. CANADA V0B2G0 giovanna.diaz@teck.com

Re: Regional Effects Program

Dear Giovanna Diaz.

On March 10, 2022, Brooks Applied Labs (BAL) received four (4) aqueous samples. The samples were logged-in for total recoverable selenium [Se], dissolved Se [Se], and Se speciation analyses, according to the chain-of-custody (COC) form.

The sample fractions for total recoverable Se and dissolved Se were not preserved in the field. The samples were preserved (pH < 2) upon receipt at BAL. All samples were preserved within the (14 calendar day) preservation holding time.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se

Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, <u>brooksapplied.com</u>.

Selenium Speciation

Each aqueous sample was analyzed for selenium speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(VI)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(VI)], selenomethionine [SeMet], selenosulfate [SeSO3], and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk SeSp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional selenium

species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

Chromatographic interference, as indicated by an elevated baseline, or co-eluting peak, was observed for selenosulfate [SeSO3] in samples 2203152-01 and 2203152-04. Due to potential bias, the affected results have been qualified as estimated (**J-1**). Upon client request, Brooks Applied Labs can apply a higher dilution to these samples to potentially mitigate the chromatographic interferences, but a higher dilution would elevate the detection limit for SeMet above the client's requested limit of 0.010µg/L.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

In instances where a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries, and the relative percent difference (RPD) values are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

Except for concentration qualifiers and items noted above, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Jèremy Maute

Senior Project Manager

Jeremy@brooksapplied.com

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at http://www.brooksapplied.com/resources/certificates-permits/ or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received	MS	matrix spike
BAL	Brooks Applied Labs	MSD	matrix spike duplicate
BLK	method blank	ND	non-detect
BS	blank spike	NR	non-reportable
CAL	calibration standard	N/C	not calculated
CCB	continuing calibration blank	PS	post preparation spike
CCV	continuing calibration verification	REC	percent recovery
COC	chain of custody record	RPD	relative percent difference
D	dissolved fraction	SCV	secondary calibration verification
DUP	duplicate	SOP	standard operating procedure
IBL	instrument blank	SRM	reference material
ICV	initial calibration verification	Т	total fraction
MDL	method detection limit	TR	total recoverable fraction
MRL	method reporting limit		

Definition of Data Qualifiers

(Effective 3/23/2020)

- E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
- Holding time and/or preservation requirements not met. Please see narrative for explanation.
- J Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
- **J-1** Estimated value. A full explanation is presented in the narrative.
- **M** Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
- **N** Spike recovery was not within acceptance criteria. Please see narrative for explanation.
- **R** Rejected, unusable value. A full explanation is presented in the narrative.
- U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
- X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
- **Z** Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA <u>SOW ILM03.0</u>, Exhibit B, Section III, pg. B-18, and the <u>USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010</u>. These supersede all previous qualifiers ever employed by BAL.

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard) Issued on: July 1, 2021; Valid to: June 30, 2022

Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)				
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn				
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn				
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn				
EPA 6020	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn				
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness				
BAL-5000	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn				
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn				
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn				
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury				
EPA 1630	Non-Potable Waters	Methyl Mercury				
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury				
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs				
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)				
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)				
SM2340B	Non-Potable Waters	Hardness				

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)					
EPA 1638 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn,					
EPA 200.8 Mod EPA 6020 Mod		Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn					
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)					
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)					
EPA 1631E Mod	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury					
BAL-3100 EPA 1630 Mod	Non-Potable Waters,						
BAL-3200	Solids/Chemicals Biological	Methyl Mercury					
EPA 1632A Mod	Non-Potable Waters	Inorganic Arsenic (ISO Only)					
BAL-3300	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)					
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb					
D.1. 4400	Non-Potable Waters	As(III), As(V), DMAs, MMAs					
BAL-4100	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)					
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)					
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet					
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)					
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)					
SM2340B	Non-Potable Waters	Hardness					
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight					



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_GHBP_WS_GGCAMP_2022-02 _NP	2203152-01	WS	Sample	02/28/2022	03/10/2022
RG_GHBP_WS_GGCAMP_2022-02 _NP-NAL	2203152-02	WS	Sample	02/28/2022	03/10/2022
RG_GHBP_WS_GGCAMP_2022-02 _NP-NAL	2203152-03	WS	Sample	02/28/2022	03/10/2022
RG_RIVER_WS_GGCAMP_2022-02 _NP	2203152-04	WS	Sample	02/28/2022	03/10/2022
 RG_RIVER_WS_GGCAMP_2022-02 _NP-NAL	2203152-05	WS	Sample	02/28/2022	03/10/2022
_ RG_RIVER_WS_GGCAMP_2022-02 _NP-NAL	2203152-06	WS	Sample	02/28/2022	03/10/2022

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
MeSe(IV)	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
MeSe(VI)	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
Se	Water	EPA 1638 Mod	03/14/2022	03/16/2022	B220573	S220322
Se(IV)	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
Se(VI)	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
SeCN	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
SeMet	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
SeSO3	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338
Unk Se Sp	Water	SOP BAL-4201	03/17/2022	03/19/2022	B220611	S220338



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_GHBP_WS	GGCAMP 20)22-02 NP								
2203152-01	DMSeO	_ WS	D	0.040		0.010	0.025	μg/L	B220611	S220338
2203152-01	MeSe(IV)	WS	D	0.052		0.010	0.025	μg/L	B220611	S220338
2203152-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B220611	S220338
2203152-01	Se(IV)	WS	D	1.33		0.010	0.075	μg/L	B220611	S220338
2203152-01	Se(VI)	WS	D	132		0.010	0.055	μg/L	B220611	S220338
2203152-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B220611	S220338
2203152-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B220611	S220338
2203152-01	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	μg/L	B220611	S220338
2203152-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B220611	S220338
RG GHBP WS	CGCAMP 20	122_02 NP_NAI								
2203152-02	Se	WS	TR	134		0.165	0.528	μg/L	B220573	S220322
2203132-02	Je	WS	110	134		0.103	0.320	μg/L	D220373	3220322
RG_GHBP_WS	G_GGCAMP_20)22-02_NP-NAL								
2203152-03	Se	WS	D	130		0.165	0.528	μg/L	B220573	S220322
RG_RIVER_WS		_	_	0.040		0.040	0.005	,,	D000044	
2203152-04	DMSeO	WS	D	0.040		0.010	0.025	μg/L	B220611	S220338
2203152-04	MeSe(IV)	WS	D	0.051		0.010	0.025	μg/L	B220611	S220338
2203152-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B220611	S220338
2203152-04	Se(IV)	WS	D	1.32		0.010	0.075	μg/L	B220611	S220338
2203152-04	Se(VI)	WS	D	130		0.010	0.055	μg/L	B220611	S220338
2203152-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B220611	S220338
2203152-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B220611	S220338
2203152-04	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	μg/L	B220611	S220338
2203152-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B220611	S220338
RG_RIVER_WS	S_GGCAMP_20	022-02_NP-NAL								
2203152-05	Se	WS	TR	130		0.165	0.528	μg/L	B220573	S220322
RG RIVER WS	S GGCAMP 2	022-02 NP-NAI								
2203152-06	Se	WS	D	132		0.165	0.528	μg/L	B220573	S220322



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Accuracy & Precision Summary

Batch: B220573 Lab Matrix: Water Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B220573-BS1	Blank Spike, (2128022) Se		200.0	195.2	μg/L	98% 75-125	;
B220573-BS2	Blank Spike, (2128022) Se		200.0	195.0	μg/L	98% 75-125	j
B220573-SRM1	Reference Material (21450	06, TMDA (51.5 Referenc	e Standard	- Bottle 5 -	SRM)	
	Se	•	14.30	14.37	μg/L	101% 75-125	5
B220573-SRM2	Reference Material (21450) Se	06, TMDA !	51.5 Referenc 14.30	e Standard 13.96	- Bottle 5 - μg/L	SRM) 98% 75-125	5
B220573-DUP4	Duplicate, (2203152-02) Se	133.5		125.8	μg/L		6% 20
B220573-MS4	Matrix Spike , (2203152-02 Se) 133.5	220.0	339.7	μg/L	94% 75-125	5
B220573-MSD4	Matrix Spike Duplicate, (2	203152-02)				
	Se	133.5	220.0	346.4	μg/L	97% 75-125	2% 20



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Accuracy & Precision Summary

Batch: B220611 Lab Matrix: Water Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B220611-BS1	Blank Spike, (2124033)						
	MeSe(IV)		5.095	5.263	μg/L	103% 75-125	
	Se(IV)		5.000	4.888	μg/L	98% 75-125	
	Se(VI)		5.000	4.690	μg/L	94% 75-125	
	SeCN		5.015	4.832	μg/L	96% 75-125	
	SeMet		4.932	4.758	μg/L	96% 75-125	
B220611-DUP6	Duplicate, (2203142-12)						
	DMSeO	ND		ND	μg/L		N/C 25
	MeSe(IV)	ND		ND	μg/L		N/C 25
	MeSe(VI)	ND		ND	μg/L		N/C 25
	Se(IV)	3.034		3.075	μg/L		1% 25
	Se(VI)	0.039		0.053	μg/L		31% 25
	SeCN	ND		ND	μg/L		N/C 25
	SeMet	ND		ND	μg/L		N/C 25
	SeSO3	ND		ND	μg/L		N/C 25
	Unk Se Sp	ND		ND	μg/L		N/C 25
B220611-MS6	Matrix Spike, (2203142-1	2)					
	Se(IV)	3.034	4.900	7.665	μg/L	95% 75-125	
	Se(VI)	0.039	5.100	5.311	μg/L	103% 75-125	
	SeCN	ND	1.962	1.800	μg/L	92% 75-125	
	SeMet	ND	1.977	1.860	μg/L	94% 75-125	
B220611-MSD6	Matrix Spike Duplicate, (2203142-12)				
	Se(IV)	3.034	4.900	7.636	μg/L	94% 75-125	0.4% 25
	Se(VI)	0.039	5.100	5.332	μg/L	104% 75-125	0.4% 25
	SeCN	ND	1.962	1.787	μg/L	91% 75-125	0.7% 25
	SeMet	ND	1.977	1.817	μg/L	92% 75-125	2% 25

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Method Blanks & Reporting Limits

Batch: B220573 Matrix: Water

Method: EPA 1638 Mod

Analyte: Se

Sample	Result	Units
B220573-BLK1	0.453	μg/L
B220573-BLK2	0.347	μg/L
B220573-BLK3	0.327	μg/L
B220573-BLK4	0.445	μg/L

 Average: 0.393
 MDL: 0.150

 Limit: 0.480
 MRL: 0.480



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Method Blanks & Reporting Limits

Batch: B220611 Matrix: Water

Method: SOP BAL-4201 Analyte: DMSeO

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	ua/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(IV)

B220611-BLK2	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.005 MRL: 0.005



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Method Blanks & Reporting Limits

	Analyte:	Se	(IV)	
--	----------	----	------	--

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.015 MRL: 0.015

Analyte: Se(VI)

Sample		Result	Units
B220611-BLK1		0.00	μg/L
B220611-BLK2		0.00	μg/L
B220611-BLK3		0.00	μg/L
B220611-BLK4		0.00	μg/L
	_		

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.010 MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

Analyte: Unk Se Sp

Sample B220611-BLK1 B220611-BLK2 B220611-BLK3	Result	Units
B220611-BLK1	0.00	μg/L
B220611-BLK2	0.00	μg/L
B220611-BLK3	0.00	μg/L
B220611-BLK4	0.00	ua/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.015
 MRL: 0.015

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152 Client PM: Giovanna Diaz Client Project: Regional Effects Program

Sample Containers

	ID: 2203152-01 ple: RG_GHBP_WS_GGCAM	P_2022-02_NP		Report Matrix: WS Sample Type: Sample + Sum			ted: 02/28/2022 ved: 03/10/2022
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 1 - 2203152
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 1 - 2203152
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 1 - 2203152
Sam	ID: 2203152-02 ple: GHBP WS GGCAMP 2022-0	OZ NID NIAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 02/28/2022 ved: 03/10/2022
_	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2142029	<2	Cooler 1 - 2203152
Sam	ID: 2203152-03 ple: GHBP_WS_GGCAMP_2022-0	D2 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 02/28/2022 ved: 03/10/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2142029	<2	Cooler 1 - 2203152
Sam	ID: 2203152-04 ple: RG_RIVER_WS_GGCAN Container	IP_2022-02_NP Size	Lot	Report Matrix: WS Sample Type: Sample + Sum Preservation	P-Lot		eted: 02/28/2022 ved: 03/10/2022 Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 1 - 2203152
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 1 - 2203152
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 1 - 2203152

Project ID: TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2203152 Client PM: Giovanna Diaz

Client Project: Regional Effects Program

Sample Containers

Lab ID: 2203152-05

Sample:

RG_RIVER_WS_GGCAMP_2022-02_NP-NAL

Des Container

A Client-Provided - TM

40 mL

Report Matrix: WS Sample Type: Sample + Sum

Campie Type: Campie : Cam

Lot na Preservation 10% HNO3 (BAL) P-Lot 2142029 pH Ship. Cont. <2 Cooler 1 -

Collected: 02/28/2022

Received: 03/10/2022

2203152

Lab ID: 2203152-06

Sample:

 ${\sf RG_RIVER_WS_GGCAMP_2022-02_NP-NAL}$

Des Container

A Client-Provided - TM

Size 40 ml Report Matrix: WS

Sample Type: Sample + Sum

Lot Preservation
na 10% HNO3 (BAL)

P-Lot 2142029 pH Ship. Cont.

<2

Collected: 02/28/2022 Received: 03/10/2022

Cooler 1 - 2203152

Shipping Containers

Cooler 1 - 2203152

Received: March 10, 2022 7:00

Tracking No: PAPS#RWHV89789 via Courier

Coolant Type: Blue Ice Temperature: 1.6 °C Description: Cooler 1
Damaged in transit? No
Returned to client? No
Comments: IR #31

Custody seals present? No Custody seals intact? No COC present? Yes



10012	COC ID: REP_GGCAMP_2022_FEB_Brooks																					
	DIECT/CLIENT INFO					NO II		1.180	and the state of						DESIGN OF	OTHER	-	1023	Statistics.	- TOP		
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	giovanna diaz@teck.com						Address						Ema		-	equisorline				3		
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City	Sparwo	nd		Province BC		-	City	Bothe		-	Province	WA	Ema	-	Turk market	perinnaw.	-	X	x	1		
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		-	/es/N									100000	1/2/2					Maxon				
			Hazardous Material (Yes/No)					CALLYSIS	Brooks_Se_Speciation	Q,	Ŀ,											
Sample ID	Sample Location (sys loc code)	Field Matrix	lazardous	Date	Time (24hr)	G=Grab C=Com	# Of Cont	N.	Brooks_Se	Brooks Se D	Brooks Se T											
RG GHBP WS GGCAMP 2022-02 NP	RG_GHBP	ws	NE SE	2022/02/28	10:00	G	1		1									1		1		
RG_GHBP_WS_GGCAMP_2022-02_NP-NAL	. RG_GHBP	ws		2022/02/28	10:00	G	2			1	1											
RG_RIVER_WS_GGCAMP_2022-02_NP	RG_RIVER	ws		2022/02/28	10:00	G	1		1													
RG_RIVER_WS_GGCAMP_2022-02_NP-NAL	RG_RIVER	ws	1 37	2022/02/28	10:00	G	2	1		1	1											
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ADDITIONAL COMMENTS/SPECIA	LINSTRUCTIONS		100	RELINQU	ISHED BY/AFF	ILIATION	7 500	D	ATE	TIME	ACC	EPTED	BY/AFE	ILIAT	ION		D	ATE/E	MES	Wilder of the last		
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SERVICE REQUEST (rash - subject	ct to availability)	100120		Calle da	Total gillo	ES PERM	75. 153		2 2	Commi	7,5,93	16.51	2 19					JU 19	87			
		r (default) X		Sampler's	Name	MAD	DY	STO	KF	-5		Mo	bile#	16	47	52	7-0	67	2			
	(1 Business Day) - 100%			Sampler's S	·	1	1	11	,	0		D .	e/Time	1	- 3							

STRAIGHT BILL OF LADING NOT NEGOTIABLE



No. 89789

24 Hour Hot Shot Service

Sparwood, BC Terrace, BC

Vancouver, BC Calgary, AB

Prince George, BC Edmonton, AB Spokane, WA

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September 21, 2022

Teck Resources Limited - Vancouver Giovanna Diaz 421 Pine Avenue Sparwood, B.C. CANADA V0B2G0 giovanna.diaz@teck.com

Re: Regional Effects Program

Dear Giovanna Diaz,

On September 15, 2022, Brooks Applied Labs (BAL) received four (4) aqueous samples. The samples were logged-in for total recoverable selenium [Se], dissolved Se [Se], and Se speciation analyses, according to the chain-of-custody (COC) form.

The **Sample ID** values listed on the chain-of-custody (COC) form did not exactly match the corresponding **Sample ID** listed on container label for 2209189-01. The discrepancy is described in the table below.

#### Sample ID Agreement Issues

Laboratory	Sample ID	Sample ID
ID (From COC)		(From Container Label)
2209189-01	RG_GHFF_WS_LAEMP_GC_2022-09_N	RG_GHFF_WS_LAEMP_GC_2022-08_N

2209189-01 was logged in and reported using the **Sample ID** listed on the COC form (*column 2 in the table above*).

**Date/Time Collected** values listed on the chain-of-custody (COC) form did not exactly match the corresponding **Date/Time Collected** values on the container labels for 2209189-04, 2209189-05, and 2209189-06. The discrepancies are described in the table below.

#### **Date/Time Collected Discrepancies**

Laboratory ID	Sample ID	Date/Time Collected (on COC form)	Date/Time Collected (on container label)
2209189-04	RG_GHNF_WS_LAEMP_GC_2022-09_N	09/09/2022 13:05	09/09/2022 13:10
2209189-05	RG_GHNF_WS_LAEMP_GC_2022-09_NP-NAL	09/09/2022 13:05	09/09/2022 13:10
2209189-06	RG_GHNF_WS_LAEMP_GC_2022-09_NP-NAL	09/09/2022 13:05	09/09/2022 13:10

2209189-04, 2209189-05, and 2209189-06 were logged in and reported using the **Date/Time Collected** values listed on the COC form (*column 3 in the table above*).

The sample fractions for total recoverable Se and dissolved Se were not preserved in the field. The samples were preserved (pH < 2) upon receipt at BAL. All sample fractions for total recoverable Se and dissolved Se were preserved within the (14 calendar day) preservation holding time.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

#### Total Recoverable Se and Dissolved Se

Each aqueous sample fraction for dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

#### Selenium Speciation

Each aqueous sample was analyzed for selenium speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(IV)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(IV)], selenomethionine [SeMet], selenosulfate  $[SeSO_3]$ , and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk Se Sp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

Chromatographic interference, as indicated by an elevated baseline, or co-eluting peak, was observed for selenosulfate [SeSO3] in samples 2209189-01 and 2209189-04. Due to potential bias, the affected results have been qualified as estimated (**J-1**). Upon client request, Brooks Applied Labs can apply a higher dilution to these samples to potentially mitigate the chromatographic interferences, but a higher dilution would elevate the detection limit for SeMet above the client's requested limit of 0.010µg/L.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

In instances where a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

In cases when either the native sample concentration was non-detectable (reported as less than or equal to the MDL) and/or the corresponding DUP result was also non-detectable, the RPD between the two values was not calculated (**N/C**).

Except for concentration qualifiers and items noted above, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely

Jeremy Maute

Senior Project Manager

Jeremy@brooksapplied.com

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### Report Information

#### **Laboratory Accreditation**

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <a href="http://www.brooksapplied.com/resources/certificates-permits/">http://www.brooksapplied.com/resources/certificates-permits/</a> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

#### **Field Quality Control Samples**

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

#### **Common Abbreviations**

AR	as received	MS	matrix spike
BAL	Brooks Applied Labs	MSD	matrix spike duplicate
BLK	method blank	ND	non-detect
BS	blank spike	NR	non-reportable
CAL	calibration standard	N/C	not calculated
CCB	continuing calibration blank	PS	post preparation spike
CCV	continuing calibration verification	REC	percent recovery
COC	chain of custody record	RPD	relative percent difference
D	dissolved fraction	scv	secondary calibration verification
DUP	duplicate	SOP	standard operating procedure
IBL	instrument blank	SRM	reference material
ICV	initial calibration verification	Т	total fraction
MDL	method detection limit	TR	total recoverable fraction
MRL	method reporting limit		

#### **Definition of Data Qualifiers**

(Effective 3/23/2020)

- E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
- Holding time and/or preservation requirements not met. Please see narrative for explanation.
- J Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
- **J-1** Estimated value. A full explanation is presented in the narrative.
- **M** Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
- **N** Spike recovery was not within acceptance criteria. Please see narrative for explanation.
- **R** Rejected, unusable value. A full explanation is presented in the narrative.
- U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
- X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
- **Z** Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA <u>SOW ILM03.0</u>, Exhibit B, Section III, pg. B-18, and the <u>USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010</u>. These supersede all previous qualifiers ever employed by BAL.

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



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Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### **Accreditation Information**

#### Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 1, 2021; Valid to: June 30, 2022

**Certificate Number: E87982-37** 

Method	Matrix	TNI Accredited Analyte(s)			
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn			
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn			
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn			
EPA 6020	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn			
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness			
BAL-5000	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn			
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn			
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn			
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury			
EPA 1630	Non-Potable Waters	Methyl Mercury			
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury			
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs			
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)			
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)			
SM2340B	Non-Potable Waters	Hardness			

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### **Accreditation Information**

# Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)
EPA 1631E Mod BAL-3100	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury
EPA 1632A Mod	Non-Potable Waters	Inorganic Arsenic (ISO Only)
BAL-3300	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb
DAI 4400	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4100	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)
SM2340B	Non-Potable Waters	Hardness
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight



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Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Sample Information

Sample	Lab ID	<b>Report Matrix</b>	Type	Sampled	Received
RG_GHFF_WS_LAEMP_GC_2022-0 9_N	2209189-01	WS	Sample	09/08/2022	09/15/2022
RG_GHFF_WS_LAEMP_GC_2022-0 9_NP-NAL	2209189-02	WS	Sample	09/08/2022	09/15/2022
RG_GHFF_WS_LAEMP_GC_2022-0 9 NP-NAL	2209189-03	WS	Sample	09/08/2022	09/15/2022
_ RG_GHNF_WS_LAEMP_GC_2022-0 9 N	2209189-04	WS	Sample	09/09/2022	09/15/2022
_ RG_GHNF_WS_LAEMP_GC_2022-0 9 NP-NAL	2209189-05	WS	Sample	09/09/2022	09/15/2022
_ RG_GHNF_WS_LAEMP_GC_2022-0 9_NP-NAL	2209189-06	WS	Sample	09/09/2022	09/15/2022

### **Batch Summary**

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
MeSe(IV)	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
MeSe(VI)	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
Se	Water	EPA 1638 Mod	09/16/2022	09/20/2022	B222134	S220972
Se(IV)	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
Se(VI)	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
SeCN	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
SeMet	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
SeSO3	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953
Unk Se Sp	Water	SOP BAL-4201	09/14/2022	09/16/2022	B222056	S220953



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG GHFF WS	LAEMP GC	2022-09 N								
2209189-01	DMSeO	ws	D	≤ 0.010	U	0.010	0.025	μg/L	B222056	S220953
2209189-01	MeSe(IV)	WS	D	0.021	J	0.010	0.025	μg/L	B222056	S220953
2209189-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222056	S220953
2209189-01	Se(IV)	WS	D	0.922		0.020	0.075	μg/L	B222056	S220953
2209189-01	Se(VI)	WS	D	157		0.010	0.055	μg/L	B222056	S220953
2209189-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222056	S220953
2209189-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222056	S220953
2209189-01	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	μg/L	B222056	S220953
2209189-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222056	S220953
PC CHEE WS	LAEMP CC	2022-09_NP-NAL								
2209189-02	_LAEWF_GC_ Se	2022-09_NF-NAL WS	D	141		0.165	0.528	μg/L	B222134	S220972
2209169-02	Se	WS	D	141		0.103	0.320	µg/L	D22213 <del>4</del>	3220912
RG_GHFF_WS	_LAEMP_GC_	2022-09_NP-NAL								
2209189-03	Se	WS	TR	150		0.165	0.528	μg/L	B222134	S220972
RG_GHNF_WS		_	_	0.040		0.040	0.005		B000050	
2209189-04	DMSeO	WS	D	0.013	J	0.010	0.025	μg/L "	B222056	S220953
2209189-04	MeSe(IV)	WS	D	0.017	J 	0.010	0.025	μg/L	B222056	S220953
2209189-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222056	S220953
2209189-04	Se(IV)	WS	D	1.17		0.020	0.075	μg/L	B222056	S220953
2209189-04	Se(VI)	WS	D	220		0.010	0.055	μg/L	B222056	S220953
2209189-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222056	S220953
2209189-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222056	S220953
2209189-04	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	μg/L	B222056	S220953
2209189-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222056	S220953
RG_GHNF_WS	_LAEMP_GC_	2022-09_NP-NAL								
2209189-05	Se	WS	D	203		0.165	0.528	μg/L	B222134	S220972
RG GHNE WS	I AFMP GC	2022-09 NP-NAL								
2209189-06	_LALWIF_GC_ Se	WS	TR	204		0.165	0.528	μg/L	B222134	S220972



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Accuracy & Precision Summary

Batch: B222056 Lab Matrix: Water Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B222056-BS1	Blank Spike, (2124033)						
	MeSe(IV)		5.095	5.504	μg/L	108% 75-125	
	Se(IV)		5.000	4.917	μg/L	98% 75-125	
	Se(VI)		5.000	4.657	μg/L	93% 75-125	
	SeCN		5.015	4.709	μg/L	94% 75-125	
	SeMet		4.932	4.821	μg/L	98% 75-125	
B222056-DUP7	Duplicate, (2209189-04)						
	DMSeO	0.013		0.011	μg/L		13% 25
	MeSe(IV)	0.017		0.018	μg/L		11% 25
	MeSe(VI)	ND		ND	μg/L		N/C 25
	Se(IV)	1.167		1.183	μg/L		1% 25
	Se(VI)	220.0		221.4	μg/L		0.6% 25
	SeCN	ND		ND	μg/L		N/C 25
	SeMet	ND		ND	μg/L		N/C 25
	SeSO3	ND		ND	μg/L		N/C 25
	Unk Se Sp	ND		ND	μg/L		N/C 25
B222056-MS7	Matrix Spike, (2209189-0	4)					
	Se(IV)	1.167	4.900	5.299	μg/L	84% 75-125	
	Se(VI)	220.0	5.100	230.4	μg/L	NR 75-125	
	SeCN	ND	1.962	1.795	μg/L	92% 75-125	
	SeMet	ND	1.977	1.885	μg/L	95% 75-125	
B222056-MSD7	Matrix Spike Duplicate, (	2209189-04	)				
	Se(IV)	1.167	4.900	5.227	μg/L	83% 75-125	1% 25
	Se(VI)	220.0	5.100	227.5	μg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.760	μg/L	90% 75-125	2% 25
	SeMet	ND	1.977	1.814	μg/L	92% 75-125	4% 25



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Accuracy & Precision Summary

Batch: B222134 Lab Matrix: Water Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC 8	& Limits	RPD & Lin	mits
B222134-BS1	<b>Blank Spike</b> , <b>(2128023)</b> Se		200.0	163.3	μg/L	82%	75-125		
B222134-BS2	Blank Spike, (2128023) Se		200.0	159.2	μg/L	80%	75-125		
B222134-BS3	Blank Spike, (2128023) Se		200.0	160.1	μg/L	80%	75-125		
B222134-SRM1	Reference Material (22140	14, TMDA 5							
	Se		14.30	11.78	μg/L	82%	75-125		
B222134-SRM2	Reference Material (22140	14, TMDA 5				•			
	Se		14.30	12.50	μg/L	87%	75-125		
B222134-SRM3	Reference Material (22140	14, TMDA 5							
	Se		14.30	11.52	μg/L	81%	75-125		
B222134-DUP2	Duplicate, (2209182-14)								
	Se	85.48		84.60	μg/L			1%	20
B222134-MS2	Matrix Spike, (2209182-14)	)							
	Se	85.48	220.0	277.7	μg/L	87%	75-125		
B222134-MSD2	Matrix Spike Duplicate, (2)	209182-14)							
	Se	85.48	220.0	267.1	μg/L	83%	75-125	4%	20
B222134-DUP5	Duplicate, (2209189-05)								
	Se	203.0		207.3	μg/L			2%	20
B222134-MS5	Matrix Spike, (2209189-05	)							
	Se	203.0	220.0	390.3	μg/L	85%	75-125		

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Accuracy & Precision Summary

Batch: B222134 Lab Matrix: Water Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	<b>REC &amp; Limits</b>	<b>RPD &amp; Limits</b>
B222134-MSD5	Matrix Spike Duplicate,	(2209189-05)					
	Se	203.0	220.0	411.6	ua/L	95% 75-125	5% 20



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### Method Blanks & Reporting Limits

Batch: B222056 Matrix: Water

Method: SOP BAL-4201 Analyte: DMSeO

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.005 MRL: 0.005



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### Method Blanks & Reporting Limits

	Analyte:	Se	(IV)	
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Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.004

 Limit: 0.015
 MRL: 0.015

#### Analyte: Se(VI)

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

#### Analyte: SeCN

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.010
 MRL: 0.010

#### Analyte: SeMet

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	ua/l

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B222056-BLK1	0.00	μg/L
B222056-BLK2	0.00	μg/L
B222056-BLK3	0.00	μg/L
B222056-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.015
 MRL: 0.015

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

Batch: B222134 Matrix: Water

Method: EPA 1638 Mod

Analyte: Se

Sample	Result	Units
B222134-BLK1	0.023	μg/L
B222134-BLK2	0.073	μg/L
B222134-BLK3	0.041	μg/L
B222134-BLK4	-0.013	μg/L

 Average: 0.031
 MDL: 0.150

 Limit: 0.480
 MRL: 0.480

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209189
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

<b>Lab ID:</b> 2209189-01 <b>Sample:</b> RG_GHFF_WS_LAEMP_GC_2022-09_N			Report Matrix: WS Sample Type: Sample + Sum	Collected: 09/08/2022 Received: 09/15/2022			
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 4 - 2209189
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209189
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209189
Lab ID: 2209189-02 Sample: RG_GHFF_WS_LAEMP_GC_2022-09_NP-NAL			Report Matrix: WS Sample Type: Sample + Sum			cted: 09/08/2022 ived: 09/15/2022	
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	125 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 2 - 2209189
Lab ID: 2209189-03 Sample: RG_GHFF_WS_LAEMP_GC_2022-09_NP-NAL			Report Matrix: WS Sample Type: Sample + Sum		Collected: 09/08/2022 Received: 09/15/2022		
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	125 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 2 - 2209189
Lab ID: 2209189-04 Sample: RG_GHNF_WS_LAEMP_GC_2022-09_N Des Container Size		Lot	Report Matrix: WS Sample Type: Sample + Sum Preservation	P-Lot		cted: 09/09/2022 ived: 09/15/2022 Ship. Cont.	
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 4 - 2209189
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209189
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209189

Project ID: TRL-VC2101 PM: Jeremy Maute



BAL Final Report 2209189 Client PM: Giovanna Diaz

Client Project: Regional Effects Program

### Sample Containers

Lab ID: 2209189-05

Sample:

RG_GHNF_WS_LAEMP_GC_2022-09_NP-NAL

**Des Container** Client-Provided - TM 125 mL

Report Matrix: WS

Sample Type: Sample + Sum

Lot **Preservation** 10% HNO3 (BAL) na

P-Lot 2230023 рH Ship. Cont. <2 Cooler 2 -

Collected: 09/09/2022

Received: 09/15/2022

2209189

Lab ID: 2209189-06

Sample:

RG_GHNF_WS_LAEMP_GC_2022-09_NP-NAL

**Des Container** Size Client-Provided - TM 125 ml Report Matrix: WS Sample Type: Sample + Sum

10% HNO3 (BAL)

**Preservation** Lot

na

P-Lot 2230023 рΗ Ship. Cont. <2 Cooler 2 -

Collected: 09/09/2022 Received: 09/15/2022

2209189

### **Shipping Containers**

Cooler 2 - 2209189

Received: September 15, 2022 7:10 Tracking No: RHWV95580 via Courier

Coolant Type: Ice Temperature: 5.3 °C

Cooler 4 - 2209189

Received: September 15, 2022 7:10 Tracking No: RHWV95580 via Courier

Coolant Type: Ice Temperature: 2.4 °C **Description:** Styrofoam Cooler Damaged in transit? No Returned to client? No Comments: IR#:1

**Description:** Styrofoam Cooler Damaged in transit? No Returned to client? No Comments: IR#:2

Custody seals present? No Custody seals intact? No **COC present?** Yes

Custody seals present? No Custody seals intact? No COC present? Yes

BAL Final Report 2209189 REP LAEMP GC 2022-RUSH: Priority TURNAROUND TIME: COC ID: Rush OR RECOKS OTHER INFO LABORATORY PROJECT/CLIENT INFO Lab Name Brooks Applied Labs Excel PDF EDD Facility Name / Job# Regional Effects Program Report Format / Distribution Lab Contact Ben Wozniak Email 1: Project Manager Giovanna Diaz AduaSciLabin Teck.com Email Ben@brooksapplied.com Email 2: Email Giovanna.Diaz@Teck.com teckcoal@equisonline.com Address 13751 Lake City Way Email 3: Address 421 Pine Avenune Teck Lab Results teck.com Suite 108 Email 4: Lisa Bowron minnow ca BC City Seattle Province WA Email 5: Sparwood Province City Canada United ! Postal Code V0B 2G1 Country Postal Code 98125 Country Email 6: Jessica.Ritz Teck.com VPO00817033 Phone Number (206) 753-6158 PO number Phone Number 1-250-865-3048 Filtered - F; Freld, L. Lab, FL; Field & Lab, N: Name SAMPLE DETAILS ANALYSIS REQUESTED Hazardous Material (Yes/No) Brooks_Se_Speciation Brooks_Se_D Brooks_Se_T G=Grab C=Com # Of Field Sample Location Sample ID (sys loc code) Matrix Date Time (24hr) Cont. RG_GHFF WS 2022/09/08 10:45 G 1 1 RG_GHFF_WS_LAEMP_GC_2022-09_N RG_GHFF_WS_LAEMP_GC_2022-09_NP-NAL RG_GHFF WS 2022/09/08 10:45 G 2 1 RG_GHNF WS 2022/09/09 13:05  $\mathbf{G}$ 1 RG_GHNF_WS_LAEMP_GC_2022-09_N 1 1 RG_GHNF_WS_LAEMP_GC_2022-09_NP-NAL RG_GHNF WS 2022/09/09 13:05 G 2

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFIL  Jennifer Ings/Minnov		ACCEPTED BY/AFFILIATION	ON DATE/TIME 9/15/27 7:10
SERVICE REQUEST (rush - subject to availability)				
Regular (default)	Sampler's Name	Jennifer Ings	Mobile #	519-500-3444

Sampler's Signature

September 12, 2022

Date/Time

Priority (2-3 business days) - 50% surcharge X Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

NOT NEGOTIABLE

250-425-7447 24 Hour Hot Shot Service

No. 9558U

BAL Final Report 2209189

Confidential

Sparwood, BC Terrace, BC Red Deer, AB

Vancouver, BC Calgary, AB Montreal, QC

Prince George, BC Edmonton, AB Spokane, WA

Elkford, BC Ft. McMurray, AB Shelby, MT

Tumbler Ridge, BC Hinton, AB Gillette, WY

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NOTICE OF CLAME: (a) No carrier is liable for icas, damage or delay of any spoods regions of such loss, damage or delay is given in writing to the synapsing carrier or recognitive to the synapsing carrier or such loss, the point of sings on the date specified from the consignor mentions destined as indicated below which the carrier agrees to carry at it is mutually agreed as to auch carrier of safe or any of the goods over all or any positive confidence which the carrier agrees to carry at its confidence is standard Ball of Lading in power at the date of sizeing which a set it is date of inspiring which a set of the confidence of the goods lated in the Ball of Lading is governed by	under the 84 of Lading unless notice, therefor setting out particulars of the the deliverang carrier within suby (60) days after the deliver in the date of shipmen; together with conditions the property herein described in apparent good order or with conditions of the consistenced in apparent good order or with conditions of the consistenced in apparent good order or with conditions of the consistence of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of the conditions of	origin instination and date of shipping the case of faiture to make delivity of the paid freight bill noted (contents and condition of concert to the rates and classifier and or arry of the goods, that every inted or written including conditions.	ment of the goods and the estimated amount daimed are within nine (9) months from the date of shipment intents of pockage unknown jimaked, consigned and ication in effect on the date of shipment service to be performed hereunder shall be subject a set aside by the standard Bill of Lading in power at the web condition.	TOTAL \$
The Contract for the caffrage of the goods listed in the Bill of Lading is governed by SHIPPER PRINT	regulation in for 19 in the jurisdiction at the time and place or simple in the consigner.  CONSIGNEE PRINT	is surject to the bulleting at	A VENEZUE LA COMP	DATE
SHIPPER SIGN	CONSIGNEE SIGN	NAME OF		TIME
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WEGG PRETTYPE			LE SEE NEW TOWN	
Cooler ID: Cooler 2 Coolant Type: (Ice)	coc(Y)N)  Blue Ice Ambient	Temperati	ure: 5.3	IR: Z

**Sampling Locations:** SP T/D T/D SP Sample Types: **Container Types:** Date: 4/15/22 Opened By: ERL

Effective 7/29/20

Notes:



**Revision 004** 

NOT NEGOTIABLE

#### 250-425-7447 24 Hour Hot Skot Service

110. 72200

Confidential

Sparwood, BC Terrace, BC Red Deer, AB

Vancouver, BC Calgary, AB Montreal, QC

Prince George, BC Edmonton, AB Spokane, WA

Elkford, BC Ft. McMurray, AB Shelby, MT

BAL Final Report 2209189 Tumbler Ridge, BC Hinton, AB Gillette, WY

INVOICE TO	TO THE ELL.				DATE
BILL OF LADING #	AND THE RESERVE		PURCHASE ORDER	NUMBER	
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DRIVER'S SIGNATURE - PICK UP BY	( UP TIME	DRIVER'S SIGNATUR	E - DELIVERY BY	FINISH TIME	GST
NOTICE OF CLAIM: (a) No carrier is liable for ices, damage or delay of any goods us respect of such loss, damage or delay is given in writing to the originating carrier of to (b) the final statement of the claim must be filled withing metioded freceived by the point of originating carrier and the point of originating the carrier agrees to carry and its amutually agreed as to sach carrier of all or carrier agrees to carry and its mutually agreed as to sach carrier of all or any of the goods over all or any portion of the carrier agrees at the date of issuing, which are the date of issuing, which are the carrier agrees of the date of issuing, which are the carrier agrees in the date of issuing.	inder the Bill of Lading unless notice. Use delivering carrier within sixty (60) of months from the date of strength, the property herein described to deliver to the consigned.	herefor setting out particulars of the lays after the delivery of the goods, on hipment, logisting with the cook, in apparent good order, except as at the said destination, subj.	ongin restriction and date of ship on the case of failure to make delin by of the paid freight bill hated (contents and condition of co act to the rates and classif	ment of the goods and the estimated amount of very within hine (9) months from " e date of ship intension of package unknown; marked, consigned fication in effect on the date of ships wenness to be cerformed hereunder shall be sui	imed ment TOTAL \$
destined is indicated services or any of the goods over all or any of the goods over all or any port all the conditions are as a care or any port and the conditions are as a care or any port and the conditions are as a care or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or any or	on of the route to destination, and as tereto agreed by the consignor and acc not accepted for himself and regulation in force in the jurisdiction at	to each party of any time interested in epted for himself and his assigns. Pr his assigns the time and place of shipmen, and	inted or written including condition is subject to the conditions set ou	is set aside by the standard Bill of Lading in now tin such conditions	F AT OWNER'S RISK WRITE ORD HERE
SHIPPER PRINT		CONSIGNEE PRINT	A LA		DATE
SHIPPER SIGN	CONSIGNEE SIGN			TIME	
WHITE: Office YELLOW: Carrier	PINK; Consignee	GOLDENROAD: Shippe	GST#	864540398RT0001	NUMBER OF PIECES RECEIVED
ANDOE PHINT ING				on some best of the	
A STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STA					190

Cooler ID: ( edler 4

coc (V/N)

Temperature: 2.4 4

**Coolant Type:** 

Blue Ice

**Ambient** 

Notes:

**Sampling Locations:** 

Sample Types:

**Container Types:** 

Opened By: 1 1/1

EV SP 125mL 40 pm Plastic

IR: 2

Revision 004

SP

Effective 7/29/20

September 28, 2022

Teck Resources Limited - Vancouver Giovanna Diaz 421 Pine Avenue Sparwood, B.C. CANADA V0B2G0 giovanna.diaz@teck.com

Re: Regional Effects Program

Dear Giovanna Diaz,

On September 22, 2022, Brooks Applied Labs (BAL) received sixteen (16) aqueous samples. The samples were logged-in for total recoverable selenium [Se], dissolved Se [Se], and Se speciation analyses, according to the chain-of-custody (COC) forms.

**Date/Time Collected** values listed on the chain-of-custody (COC) form did not exactly match the corresponding **Date/Time Collected** values on the container labels for 2209284-11, 2209284-17, 2209284-18, and 2209284-21. The discrepancies are described in the table below.

#### **Date/Time Collected Discrepancies**

Laboratory ID	Sample ID	Date/Time Collected (on COC form)	Date/Time Collected (on container label)		
2209284-11	RG_GHUT_WS_LAEMP_GC_2022-09_NP-NAL	09/15/22 8:05	09/15/22 8:12		
2209284-17	RG_GHCKD_WS_LAEMP_GC_2022-09_NP-NAL	09/15/22 13:40	09/14/22 13:40		
2209284-18	RG_GHCKD_WS_LAEMP_GC_2022-09_NP-NAL	09/15/22 13:40	09/1422 13:40		
2209284-21	RG_FODGH_WS_LAEMP_GC_2022-09_NP-NAL	09/18/22 9:00	09/16/22 9:00		

for 2209284-11, 2209284-17, 2209284-18, and 2209284-21 were logged in and reported using the **Date/Time Collected** values listed on the COC form (*column 3 in the table above*).

The sample fractions for total recoverable Se and dissolved Se were not preserved in the field. The samples were preserved (pH < 2) upon receipt at BAL. All sample fractions for total recoverable Se and dissolved Se were preserved within the (14 calendar day) preservation holding time.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

#### Total Recoverable Se and Dissolved Se

Each aqueous sample fraction for dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced

interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

#### Selenium Speciation

Each aqueous sample was analyzed for selenium speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(IV)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(IV)], selenomethionine [SeMet], selenosulfate  $[SeSO_3]$ , and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk SeSp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

Chromatographic interference, as indicated by an elevated baseline, or co-eluting peak, was observed for selenosulfate in 2209284-13. Due to potential bias, the affected result has been qualified as estimated (**J-1**). Brooks Applied Labs can apply a higher dilution to this sample to potentially mitigate the chromatographic interferences, but a higher dilution would elevate the detection limit for SeMet above the client's requested limit of 0.010µg/L.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

In instances where a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

In cases when either the native sample concentration was non-detectable (reported as less than or equal to the MDL) and/or the corresponding DUP result was also non-detectable, the RPD between the two values was not calculated (**N/C**).

Except for concentration qualifiers and the item noted above, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Jeremy Maute

Senior Project Manager

Jeremy@brooksapplied.com

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284

Client PM: Giovanna Diaz

Client Project: Regional Effects Program

### Report Information

#### **Laboratory Accreditation**

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <a href="http://www.brooksapplied.com/resources/certificates-permits/">http://www.brooksapplied.com/resources/certificates-permits/</a> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

#### **Field Quality Control Samples**

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

#### **Common Abbreviations**

AR	as received	MS	matrix spike
BAL	Brooks Applied Labs	MSD	matrix spike duplicate
BLK	method blank	ND	non-detect
BS	blank spike	NR	non-reportable
CAL	calibration standard	N/C	not calculated
CCB	continuing calibration blank	PS	post preparation spike
CCV	continuing calibration verification	REC	percent recovery
COC	chain of custody record	RPD	relative percent difference
D	dissolved fraction	scv	secondary calibration verification
DUP	duplicate	SOP	standard operating procedure
IBL	instrument blank	SRM	reference material
ICV	initial calibration verification	Т	total fraction
MDL	method detection limit	TR	total recoverable fraction
MRL	method reporting limit		

#### **Definition of Data Qualifiers**

(Effective 3/23/2020)

- E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
- Holding time and/or preservation requirements not met. Please see narrative for explanation.
- J Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
- **J-1** Estimated value. A full explanation is presented in the narrative.
- **M** Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
- **N** Spike recovery was not within acceptance criteria. Please see narrative for explanation.
- **R** Rejected, unusable value. A full explanation is presented in the narrative.
- U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
- X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
- **Z** Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA <u>SOW ILM03.0</u>, Exhibit B, Section III, pg. B-18, and the <u>USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010</u>. These supersede all previous qualifiers ever employed by BAL.

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### **Accreditation Information**

#### Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)

Issued on: July 1, 2021; Valid to: June 30, 2022 Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
BAL-5000	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### **Accreditation Information**

# Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)			
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn			
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)			
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)			
EPA 1631E Mod BAL-3100	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury			
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury			
EPA 1632A Mod	Non-Potable Waters	Inorganic Arsenic (ISO Only)			
BAL-3300	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)			
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb			
DAI 4400	Non-Potable Waters	As(III), As(V), DMAs, MMAs			
BAL-4100	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)			
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)			
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet			
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)			
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)			
SM2340B	Non-Potable Waters	Hardness			
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight			



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Sample Information

Sample	Lab ID	Report Matrix	Туре	Sampled	Received
RG_GHBP_WS_LAEMP_GC_2022-0 9_N	2209284-01	WS	Sample	09/12/2022	09/22/2022
_ RG_GHBP_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-02	WS	Sample	09/12/2022	09/22/2022
RG_GHBP_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-03	WS	Sample	09/12/2022	09/22/2022
RG_GANF_WS_LAEMP_GC_2022-0 9_N	2209284-04	WS	Sample	09/13/2022	09/22/2022
RG_GANF_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-05	WS	Sample	09/13/2022	09/22/2022
RG_GANF_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-06	WS	Sample	09/13/2022	09/22/2022
RG_GAUT_WS_LAEMP_GC_2022-0 9_N	2209284-07	WS	Sample	09/14/2022	09/22/2022
RG_GAUT_WS_LAEMP_GC_2022-0 9 NP-NAL	2209284-08	WS	Sample	09/14/2022	09/22/2022
RG_GAUT_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-09	WS	Sample	09/14/2022	09/22/2022
RG_GHUT_WS_LAEMP_GC_2022-0 9_N	2209284-10	WS	Sample	09/15/2022	09/22/2022
RG_GHUT_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-11	WS	Sample	09/15/2022	09/22/2022
RG_GHUT_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-12	WS	Sample	09/15/2022	09/22/2022
RG_GHDT_WS_LAEMP_GC_2022-0 9_N	2209284-13	WS	Sample	09/16/2022	09/22/2022
RG_GHDT_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-14	WS	Sample	09/16/2022	09/22/2022
RG_GHDT_WS_LAEMP_GC_2022-0 9_NP-NAL	2209284-15	WS	Sample	09/16/2022	09/22/2022
RG_GHCKD_WS_LAEMP_GC_2022 -09_N	2209284-16	WS	Sample	09/15/2022	09/22/2022
RG_GHCKD_WS_LAEMP_GC_2022 -09_NP-NAL	2209284-17	WS	Sample	09/15/2022	09/22/2022
RG_GHCKD_WS_LAEMP_GC_2022 -09_NP-NAL	2209284-18	WS	Sample	09/15/2022	09/22/2022
RG_FODGH_WS_LAEMP_GC_2022 -09_N	2209284-19	WS	Sample	09/18/2022	09/22/2022
RG_FODGH_WS_LAEMP_GC_2022 -09_NP-NAL	2209284-20	WS	Sample	09/18/2022	09/22/2022
RG_FODGH_WS_LAEMP_GC_2022 -09_NP-NAL	2209284-21	WS	Sample	09/18/2022	09/22/2022



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Sample Information

Sample	Lab ID	<b>Report Matrix</b>	Type	Sampled	Received
RG_RIVER_WS_LAEMP_GC_2022-	2209284-22	WS	Sample	09/12/2022	09/22/2022
09_N					
RG_RIVER_WS_LAEMP_GC_2022-	2209284-23	WS	Sample	09/12/2022	09/22/2022
09_NP-NAL					
RG_RIVER_WS_LAEMP_GC_2022-	2209284-24	WS	Sample	09/12/2022	09/22/2022
09_NP-NAL					

### **Batch Summary**

Analyte	<b>Lab Matrix</b>	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
MeSe(IV)	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
MeSe(VI)	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
Se	Water	EPA 1638 Mod	09/23/2022	09/26/2022	B222203	S221000
Se(IV)	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
Se(VI)	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
SeCN	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
SeMet	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
SeSO3	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995
Unk Se Sp	Water	SOP BAL-4201	09/20/2022	09/23/2022	B222130	S220995



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Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence		
RG_GHBP_WS_LAEMP_GC_2022-09_N												
2209284-01	DMSeO	ws	D	0.111		0.010	0.025	μg/L	B222130	S220995		
2209284-01	MeSe(IV)	WS	D	0.061		0.010	0.025	μg/L	B222130	S220995		
2209284-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995		
2209284-01	Se(IV)	WS	D	2.84		0.020	0.075	μg/L	B222130	S220995		
2209284-01	Se(VI)	WS	D	137		0.010	0.055	μg/L	B222130	S220995		
2209284-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995		
2209284-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995		
2209284-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995		
2209284-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995		
PC CUPD W	RG_GHBP_WS_LAEMP_GC_2022-09_NP-NAL											
2209284-02	S_LAEWP_GC_ Se	_2022-09_NF-NAL WS	D	127		0.165	0.528	μg/L	B222203	S221000		
2209204-02	36	WS	D	127		0.103	0.326	µg/L	D222203	3221000		
RG_GHBP_WS	S_LAEMP_GC_	2022-09_NP-NAL										
2209284-03	Se	WS	TR	124		0.165	0.528	μg/L	B222203	S221000		
DO 04NE 14		2000 00 14										
RG_GANF_WS		_	<b>D</b>	≤ 0.010	U	0.010	0.025	/1	D222420	0000005		
2209284-04	DMSeO	WS WS	D D	≤ 0.010 ≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995		
2209284-04 2209284-04	MeSe(IV) MeSe(VI)	WS	D	≤ 0.010 ≤ 0.010	U	0.010	0.025	μg/L μg/L	B222130 B222130	S220995 S220995		
2209284-04	Se(IV)	WS	D	0.167	U	0.010	0.025	μg/L μg/L	B222130 B222130	S220995 S220995		
2209284-04	Se(VI)	WS	D	5.24		0.020	0.075	μg/L μg/L	B222130 B222130	S220995 S220995		
2209284-04	Se(VI)	WS	D	5.2 <del>4</del> ≤ 0.010	U	0.010	0.050	μg/L μg/L	B222130	S220995		
2209284-04	SeMet	WS	D	≤ 0.010 ≤ 0.010	U	0.010	0.030	μg/L μg/L	B222130	S220995		
2209284-04	SeSO3	WS	D	≤ 0.010 ≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995		
2209284-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995		
2203204-04	опк ос ор	WO	D	= 0.010	Ü	0.010	0.070	P9/L	D222100	0220333		
	S_LAEMP_GC_	2022-09_NP-NAL										
2209284-05	Se	WS	D	5.00		0.165	0.528	μg/L	B222203	S221000		
RG GANF WS	S LAEMP GC	2022-09 NP-NAL										
2209284-06	Se	WS	TR	5.06		0.165	0.528	μg/L	B222203	S221000		



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_GAUT_WS	_LAEMP_GC_	2022-09_N								
2209284-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-07	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-07	Se(IV)	WS	D	0.131		0.020	0.075	μg/L	B222130	S220995
2209284-07	Se(VI)	WS	D	0.510		0.010	0.055	μg/L	B222130	S220995
2209284-07	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-07	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995
2209284-07	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
PC CAUT WS	LAEMP CC	2022-09 NP-NAL								
2209284-08	_LAEWF_GC_ Se	_2022-09_NF-NAL WS	D	0.877		0.165	0.528	ua/l	B222203	S221000
2209264-06	36	WS	U	0.077		0.103	0.320	μg/L	D222203	3221000
RG_GAUT_WS	_LAEMP_GC_	2022-09_NP-NAL								
2209284-09	Se	WS	TR	0.967		0.165	0.528	μg/L	B222203	S221000
RG_GHUT_WS		_	_			0.040	0.005		D000400	
2209284-10	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-10	MeSe(IV)	WS	D	0.012	J	0.010	0.025	μg/L	B222130	S220995
2209284-10	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-10	Se(IV)	WS	D	0.422		0.020	0.075	μg/L	B222130	S220995
2209284-10	Se(VI)	WS	D	244		0.010	0.055	μg/L	B222130	S220995
2209284-10	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-10	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-10	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995
2209284-10	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
RG_GHUT_WS	_LAEMP_GC	2022-09_NP-NAL								
2209284-11	Se Se	ws	D	228		0.165	0.528	μg/L	B222203	S221000
RG GHIIT WS	I AFMP GC	2022-09 NP-NAL								
2209284-12	_ <b></b>	WS	TR	232		0.165	0.528	μg/L	B222203	S221000



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_GHDT_WS	LAEMP GC	2022-09 N								
2209284-13	DMSeO	ws	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-13	MeSe(IV)	WS	D	0.016	J	0.010	0.025	μg/L	B222130	S220995
2209284-13	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-13	Se(IV)	WS	D	1.25		0.020	0.075	μg/L	B222130	S220995
2209284-13	Se(VI)	WS	D	229		0.010	0.055	μg/L	B222130	S220995
2209284-13	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-13	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-13	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	μg/L	B222130	S220995
2209284-13	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
DC CUDT WG	LAEMB CC	2022 00 NB NAI								
	Se	<b>2022-09_NP-NAL</b> WS	D	200		0.165	0.528	ua/l	B222203	\$221000
2209284-14	Se	VVS	D	200		0.105	0.526	μg/L	DZZZZUJ	S221000
RG GHDT WS	LAEMP GC	2022-09 NP-NAL								
2209284-15	Se Se	ws	TR	199		0.165	0.528	μg/L	B222203	S221000
RG_GHCKD_V	VS_LAEMP_G	C_2022-09_N								
2209284-16	DMSeO	WS	D	0.074		0.010	0.025	μg/L	B222130	S220995
2209284-16	MeSe(IV)	WS	D	0.069		0.010	0.025	μg/L	B222130	S220995
2209284-16	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-16	Se(IV)	WS	D	2.54		0.020	0.075	μg/L	B222130	S220995
2209284-16	Se(VI)	WS	D	117		0.010	0.055	μg/L	B222130	S220995
2209284-16	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-16	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-16	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995
2209284-16	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
RG GHCKD M	VS LAFMD CO	C 2022-09 NP-NA	ı							
2209284-17	Se	WS	<b>D</b>	126		0.165	0.528	μg/L	B222203	S221000
220320 <del>4-</del> 17	00	VVO	D	120		0.100	0.020	µg/∟	DZZZZOS	3221000
RG_GHCKD_W	VS_LAEMP_GO	C_2022-09_NP-NA	L							
2209284-18	Se	WS	TR	130		0.165	0.528	μg/L	B222203	S221000



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG FODGH W	S LAEMP GO	2022-09 N								
2209284-19	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-19	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-19	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-19	Se(IV)	WS	D	0.293		0.020	0.075	μg/L	B222130	S220995
2209284-19	Se(VI)	WS	D	48.1		0.010	0.055	μg/L	B222130	S220995
2209284-19	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-19	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-19	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995
2209284-19	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
DO FOROU W	/C / AEMB 00	2022 00 NB NA	•							
		<b>:_2022-09_NP-NA</b> I WS	L D	41.3		0.165	0.528	ua/l	Pagago	0004000
2209284-20	Se	VVS	D	41.3		0.165	0.528	μg/L	B222203	S221000
RG FODGH W	/S LAEMP GO	2022-09 NP-NA	L							
2209284-21	Se _	WS	TR	44.0		0.165	0.528	μg/L	B222203	S221000
RG_RIVER_WS	S LAEMP GC	2022-09 N								
2209284-22	DMSeO	ws	D	0.092		0.010	0.025	μg/L	B222130	S220995
2209284-22	MeSe(IV)	WS	D	0.068		0.010	0.025	μg/L	B222130	S220995
2209284-22	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-22	Se(IV)	WS	D	2.91		0.020	0.075	μg/L	B222130	S220995
2209284-22	Se(VI)	WS	D	138		0.010	0.055	μg/L	B222130	S220995
2209284-22	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222130	S220995
2209284-22	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222130	S220995
2209284-22	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222130	S220995
2209284-22	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222130	S220995
DC DIVED W	S LAEMD CC	2022 00 ND NA								
		_2022-09_NP-NAL	Ь	100		0.465	0.500	ua/l	Pagago	0004000
2209284-23	Se	WS	D	122		0.165	0.528	μg/L	B222203	S221000
RG_RIVER_WS	S_LAEMP_GC_	_2022-09_NP-NAL								
2209284-24	Se	WS	TR	134		0.165	0.528	μg/L	B222203	S221000



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Accuracy & Precision Summary

Batch: B222130 Lab Matrix: Water Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B222130-BS1	Blank Spike, (2124033)						
	MeSe(IV)		5.095	6.159	μg/L	121% 75-125	
	Se(IV)		5.000	5.689	μg/L	114% 75-125	
	Se(VI)		5.000	5.231	μg/L	105% 75-125	
	SeCN		5.015	5.177	μg/L	103% 75-125	
	SeMet		4.932	5.459	μg/L	111% 75-125	
B222130-DUP2	Duplicate, (2209284-10)						
	DMSeO	ND		ND	μg/L		N/C 25
	MeSe(IV)	0.012		ND	μg/L		N/C 25
	MeSe(VI)	ND		ND	μg/L		N/C 25
	Se(IV)	0.422		0.430	μg/L		2% 25
	Se(VI)	244.4		244.4	μg/L		0.01% 25
	SeCN	ND		ND	μg/L		N/C 25
	SeMet	ND		ND	μg/L		N/C 25
	SeSO3	ND		ND	μg/L		N/C 25
	Unk Se Sp	ND		ND	μg/L		N/C 25
B222130-MS2	Matrix Spike, (2209284-1	0)					
	Se(IV)	0.422	4.900	4.870	μg/L	91% 75-125	
	Se(VI)	244.4	5.100	249.8	μg/L	NR 75-125	
	SeCN	ND	1.962	1.814	μg/L	92% 75-125	
	SeMet	ND	1.977	1.982	μg/L	100% 75-125	
B222130-MSD2	Matrix Spike Duplicate, (	2209284-10	)				
	Se(IV)	0.422	4.900	4.994	μg/L	93% 75-125	3% 25
	Se(VI)	244.4	5.100	251.2	μg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.836	μg/L	94% 75-125	1% 25
	SeMet	ND	1.977	1.999	μg/L	101% 75-125	0.8% 25



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Accuracy & Precision Summary

Batch: B222203 Lab Matrix: Water Method: EPA 1638 Mod

Sample B222203-BS1	Analyte Blank Spike, (2128023) Se	Native	<b>Spike</b> 200.0	Result	<b>Units</b> μg/L	REC & Limits 87% 75-125	
B222203-BS2	Blank Spike, (2128023) Se		200.0	178.8	μg/L	89% 75-125	;
B222203-BS3	Blank Spike, (2128023) Se		200.0	179.9	μg/L	90% 75-125	;
B222203-BS4	Blank Spike, (2128023) Se		200.0	173.4	μg/L	87% 75-125	j
B222203-BS5	Blank Spike, (2128023) Se		200.0	182.9	μg/L	91% 75-125	j
B222203-SRM1	Reference Material (22140 Se	16, TMDA 5	14.30	e Standard 12.81	- <b>Bottle 8 - S</b> μg/L	<b>SRM)</b> 90% 75-125	5
B222203-SRM2	Reference Material (22140 Se	16, TMDA 5	14.30	e Standard 13.33	- <b>Bottle 8 - S</b> μg/L	<b>SRM)</b> 93% 75-125	j
B222203-SRM3	Reference Material (22140 Se	16, TMDA 5	<b>11.5 Referenc</b> 14.30	e Standard 13.09	- <b>Bottle 8 - S</b> µg/L	<b>SRM)</b> 92% 75-125	)
B222203-SRM4	Reference Material (22140 Se	16, TMDA 5	11.5 Referenc 14.30	e Standard 13.25	- <b>Bottle 8 - \$</b> µg/L	<b>SRM)</b> 93% 75-125	5
B222203-SRM5	Reference Material (22140 Se	16, TMDA 5	11.5 Referenc 14.30	e Standard 13.11	- <b>Bottle 8 - 5</b> µg/L	<b>SRM)</b> 92% 75-125	5
B222203-DUP1	Duplicate, (2209283-06) Se	1.829		1.882	μg/L		3% 20



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Accuracy & Precision Summary

Batch: B222203 Lab Matrix: Water Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B222203-MS1	<b>Matrix Spike</b> , (2209283-06) Se	1.829	220.0	198.2	μg/L	89% 75-125	
B222203-MSD1	Matrix Spike Duplicate, (22 Se	2 <b>09283-06)</b> 1.829	220.0	202.7	μg/L	91% 75-125	2% 20
B222203-DUP2	<b>Duplicate, (2209284-09)</b> Se	0.967		0.911	μg/L		6% 20
B222203-MS2	Matrix Spike, (2209284-09) Se	0.967	220.0	204.6	μg/L	93% 75-125	
B222203-MSD2	Matrix Spike Duplicate, (22 Se	<b>209284-09)</b> 0.967	220.0	203.1	μg/L	92% 75-125	0.8% 20



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### Method Blanks & Reporting Limits

Batch: B222130 Matrix: Water

Method: SOP BAL-4201 Analyte: DMSeO

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.005 MRL: 0.005



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

### Method Blanks & Reporting Limits

Analyte:	Se	(IV)
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Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.004

 Limit: 0.015
 MRL: 0.015

#### Analyte: Se(VI)

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

#### Analyte: SeCN

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.010
 MRL: 0.010

#### Analyte: SeMet

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	ua/l

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

**Average:** 0.000 **MDL:** 0.002 **Limit:** 0.011 **MRL:** 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B222130-BLK1	0.00	μg/L
B222130-BLK2	0.00	μg/L
B222130-BLK3	0.00	μg/L
B222130-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.015
 MRL: 0.015

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Method Blanks & Reporting Limits

Batch: B222203 Matrix: Water

Method: EPA 1638 Mod

Analyte: Se

Sample	Result	Units
	Result	Offics
B222203-BLK1	-0.026	μg/L
B222203-BLK2	-0.076	μg/L
B222203-BLK3	-0.031	μg/L
B222203-BLK4	-0.040	μg/L
B222203-BLK5	-0.054	μg/L

 Average: -0.045
 MDL: 0.150

 Limit: 0.480
 MRL: 0.480

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Silent Project: Regional Ellects Program

Sam	<b>ID:</b> 2209284-01 <b>ple:</b> RG_GHBP_WS_LAEMP_			Report Matrix: WS Sample Type: Sample + Sum		Recei	cted: 09/12/2022 ived: 09/22/2022
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none na		na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209284
Sam	ID: 2209284-02 ple: GHBP_WS_LAEMP_GC_2022	2-09 NP-NAL		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/12/2022 ived: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Sam	ID: 2209284-03 ple: GHBP_WS_LAEMP_GC_2022	2-09 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/12/2022 ived: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Sam	ID: 2209284-04 ple: RG_GANF_WS_LAEMP_ Container	GC_2022-09_N Size	Lot	Report Matrix: WS Sample Type: Sample + Sum Preservation	P-Lot		cted: 09/13/2022 ived: 09/22/2022 Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209284

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz

Client Project: Regional Effects Program

### Sample Containers

Lab ID: 2209284-05 Report Matrix: WS Collected: 09/13/2022 Sample: Received: 09/22/2022 Sample Type: Sample + Sum RG GANF WS LAEMP GC 2022-09 NP-NAL **Des Container Size** Lot **Preservation** P-Lot рH Ship. Cont. 10% HNO3 (BAL) Client-Provided - TM 40 mL na 2230023 <2 Cooler 3 -2209284 Lab ID: 2209284-06 Report Matrix: WS Collected: 09/13/2022 Received: 09/22/2022 Sample: Sample Type: Sample + Sum RG_GANF_WS_LAEMP_GC_2022-09_NP-NAL **Des Container** Size **Preservation** P-Lot рΗ Lot Ship. Cont. Client-Provided - TM 40 ml 10% HNO3 (BAL) 2230023 <2 Cooler 3 na 2209284 Lab ID: 2209284-07 Report Matrix: WS Collected: 09/14/2022 Sample: RG GAUT WS LAEMP GC 2022-09 N Sample Type: Sample + Sum Received: 09/22/2022 **Des Container** Size **Preservation** P-Lot Lot pН Ship. Cont. Cent Tube 15mL Se-Sp 15 mL Α none Cooler 4 na na na 2209284 В XTRA VOL 15 mL na none na na Cooler 4 -2209284 С XTRA_VOL Cooler 4 -125 mL na none na na 2209284 Lab ID: 2209284-08 Collected: 09/14/2022 Report Matrix: WS Received: 09/22/2022 Sample: Sample Type: Sample + Sum RG_GAUT_WS_LAEMP_GC_2022-09_NP-NAL **Des Container** Size Lot **Preservation** P-Lot рΗ Ship. Cont. Client-Provided - TM 40 mL 10% HNO3 (BAL) 2230023 <2 Cooler 3 na 2209284 Lab ID: 2209284-09 Report Matrix: WS Collected: 09/14/2022 Sample: Received: 09/22/2022 Sample Type: Sample + Sum RG GAUT WS LAEMP GC 2022-09 NP-NAL Container Size **Preservation** P-Lot Ship. Cont. Lot Ha Client-Provided - TM 40 mL 10% HNO3 (BAL) 2230023 <2 Cooler 3 na 2209284

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

	<b>ID</b> : 2209284-10 <b>ple</b> : RG_GHUT_WS_LAEMP_	_GC_2022-09_N		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/15/2022 ived: 09/22/2022
Des	Container	Size	Lot	Preservation	P-Lot	pН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	none na		Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209284
Sam	ID: 2209284-11 ple: GHUT_WS_LAEMP_GC_202:	2-09 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/15/2022 ived: 09/22/2022
_	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Sam	ID: 2209284-12 ple: GHUT_WS_LAEMP_GC_202:	2-09 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/15/2022 ived: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Lab ID: 2209284-13 Sample: RG_GHDT_WS_LAEMP_GC_2022-09_N Des Container Size		Lot	Report Matrix: WS Sample Type: Sample + Sum Preservation	P-Lot		cted: 09/16/2022 ived: 09/22/2022 Ship. Cont.	
Α	Cent Tube 15mL Se-Sp	15 mL	na	none na		na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none na		na	Cooler 4 - 2209284

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

Sam	ID: 2209284-14 ple: GHDT_WS_LAEMP_GC_2022	2-09 NP-NAL		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/16/2022 ved: 09/22/2022
_	Container Client-Provided - TM	Size 40 mL	Lot na	Preservation 10% HNO3 (BAL)	P-Lot 2230023	<b>pH</b> <2	Ship. Cont. Cooler 3 - 2209284
Sam	ID: 2209284-15 ple: GHDT_WS_LAEMP_GC_2022	2-09 NP-NAL		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/16/2022 ved: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Sam	ID: 2209284-16 ple: RG_GHCKD_WS_LAEMP			Report Matrix: WS Sample Type: Sample + Sum		Recei	cted: 09/15/2022 ved: 09/22/2022
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209284
Sam	ID: 2209284-17 ple: GHCKD_WS_LAEMP_GC_202	22 00 ND NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/15/2022 ved: 09/22/2022
_	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Sam	ID: 2209284-18 ple: GHCKD_WS_LAEMP_GC_202	22-09_NP-NAL		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/15/2022 ved: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209284 Client PM: Giovanna Diaz Client Project: Regional Effects Program

	I <b>D:</b> 2209284-19 ple: RG_FODGH_WS_LAEMF	P_GC_2022-09_N		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/18/2022 ived: 09/22/2022
Des	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none na		na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 4 - 2209284
Sam	ID: 2209284-20 ple: FODGH_WS_LAEMP_GC_20	22-09 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/18/2022 ived: 09/22/2022
	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)			Cooler 3 - 2209284
Sam	ID: 2209284-21 ple: FODGH WS LAEMP GC 20	22-09 NP-NAI		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/18/2022 ived: 09/22/2022
_	Container	Size	Lot	Preservation	P-Lot	рН	Ship. Cont.
Α	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2230023	<2	Cooler 3 - 2209284
Lab ID: 2209284-22 Sample: RG_RIVER_WS_LAEMP_GC_2022-09_N Des Container Size		Lot	Report Matrix: WS Sample Type: Sample + Sum Preservation	P-Lot		cted: 09/12/2022 ived: 09/22/2022 Ship. Cont.	
Α	Cent Tube 15mL Se-Sp	15 mL	na	none na		na	Cooler 4 - 2209284
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 4 - 2209284
С	XTRA_VOL	125 mL	na	none na		na	Cooler 4 - 2209284

Project ID: TRL-VC2101 PM: Jeremy Maute



BAL Final Report 2209284 Client PM: Giovanna Diaz

Client Project: Regional Effects Program

### Sample Containers

Lab ID: 2209284-23

Sample:

RG RIVER WS LAEMP GC 2022-09 NP-NAL

**Des Container** 

Client-Provided - TM 40 mL Lot

Lot

na

**Preservation** na

Report Matrix: WS

10% HNO3 (BAL)

Sample Type: Sample + Sum

P-Lot 2230023 рH Ship. Cont. Cooler 3 -<2

Collected: 09/12/2022

Received: 09/22/2022

2209284

Lab ID: 2209284-24

Sample:

RG_RIVER_WS_LAEMP_GC_2022-09_NP-NAL

**Des Container** Client-Provided - TM

Size 40 ml Report Matrix: WS Sample Type: Sample + Sum

**Preservation** 10% HNO3 (BAL)

P-Lot 2230023 рΗ Ship. Cont. <2

Collected: 09/12/2022 Received: 09/22/2022

> Cooler 3 -2209284

### **Shipping Containers**

Cooler 3 - 2209284

Received: September 22, 2022 7:37 Tracking No: RWHV95583 via Courier

Coolant Type: Blue Ice Temperature: 9.6 °C

Cooler 4 - 2209284

Received: September 22, 2022 7:37 Tracking No: RWHV95583 via Courier

Coolant Type: Blue Ice Temperature: -0.3 °C

**Description:** Styrofoam Cooler Damaged in transit? No Returned to client? No Comments: IR#:1

**Description:** Styrofoam Cooler Damaged in transit? No Returned to client? No Comments: IR#:1

Custody seals present? No Custody seals intact? No COC present? Yes

Custody seals present? No Custody seals intact? No COC present? No



Conf <b>dentia</b>															В	AL Fina	l Repo	rt 2209	9284
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	PROJECT/CLIENT INFO	)	100 1027					LABOR	ATORY					11	OTHE	R INFO			
	Regional Effects Program							Brooks Ap		s		Re	port Fo	rmat / D	istributi	on	Excel	PDF	EDD
Project Manager						Lab		Ben Wozn				Em	ail 1:	Agua	Scil ab T	eck.com	X	X	<i>X</i> -
	Giovanna.Diaz@Teck.com							Ben@bro				Em	ail 2:	teckco	almeguisor	nline.com			X
Address	421 Pine Avenune					1		13751 Lak	e City Wa	ay		_	ail 3:	Teckt	b.Resultst	oteck com	X	X	X
								Suite 108			,	-	ail 4:	Lisa.	Bow ron mi	innow.ca	X	X	X
City				vince BC				Seattle		Province	WA	-	ail 5:	Aw	eibe@minn	ow.ca	X	X	X
Postal Code		il	Соц	untry Cai	nada		al Code			Country	United	-	ail 6:	Vess	ca.Ritz@Te		X	X	X
Phone Number	1-250-865-3048	TARRO.				Phone I	Number	(206) 753-					umber	100			817033		
	SAMPLE DE	TAILS			·	* -			ANA	LYSIS RE	QUESTI	ED			File	ered - F Fie	ld, L: Lab, I	I. Field A	Lab, N. N
			Zo)					PRESERV.	N	N					-140				H
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Com	# Of Cont.	Brooks Se Speciation	Brooks_Se_D	Brooks_Se_T					was waga				
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RG_GHBP_WS_LAEMP_GC_2022-09_NP-NAL	RG_GHBP	ws	2	2022/09/12	7:44	G	2		1	1		4.				19			
RG_GANF_WS_LAEMP_GC_2022-09_N	RG_GANF	ws	2	2022/09/13	9:25	G	1	1						1					
RG_GANF_WS_LAEMP_GC_2022-09_NP-NAL	RG_GANF	ws	2	2022/09/13	9:25	G	2		1	1									
RG_GAUT_WS_LAEMP_GC_2022-09_N	RG_GAUT	ws	2	2022/09/14	8:50	G	1	1											
RG_GAUT_WS_LAEMP_GC_2022-09_NP-NAL	RG_GAUT	ws	2	2022/09/14	8:50	G	2		1	1									-
RG_GHUT_WS_LAEMP_GC_2022-09_N	RG_GHUT	ws	2	2022/09/15	8:05	G	1	1				100							
RG_GHUT_WS_LAEMP_GC_2022-09_NP-NAL	RG_GHUT	ws	2	2022/09/15	8:05	G	2		1	1					15.				
RG_GHDT_WS_LAEMP_GC_2022-09_N	RG_GHDT	ws	2	2022/09/16	8:55	G	- 1	1											
RG_GHDT_WS_LAEMP_GC_2022-09_NP-NAL	RG_GHDT	WS	2	2022/09/16	8:55	G	2		1	1					4.				
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For Emergency <1 Day,			Sa	impler's Si	onsture	1		are a s	/		Date	/Time			Santa	mber 1	2022		

BAL Final Report 2209284

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	Regional Effects Program							Brooks Ap Ben Wozn	oplied Lab	S				rmat / Di			Excel	PDF	EDD
Project Manager	Giovanna Diaz  Giovanna.Diaz  Teck.com					Lab			nak oksapplie	d com			ail 1: ail 2:		Scilab@Te		X	X	X
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City	Sparwoo	d		Province BC			City	Seattle		Province	WA	+	ail 5:		ibe@minn		X	X	X
Postal Code	V0B 2G	1		Country Can	ada	Post	al Code			Country	United	Ema	ail 6:		a Ritz DTe		X	X	X
Phone Number	1-250-865-3048					Phone I	Number	(206) 753-					umber				817033		
	SAMPLE DE	TAILS							ANA	LYSIS RI	EQUESTI	D			Filt	ered - P; Fie	distributed	La: Field &	into N: Nor
								₫ F	N	N	1			PER	110			- 15	
			al (Yes/No)					tion											
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Com		Brooks_Se_Speciation	Brooks_Se_D	Brooks_Se_T					-40-				
RG_GHCKD_WS_LAEMP_GC_2022-09_N	RG_GHCKD	ws		2022/09/15	13:40	G	1	1					-	-	F Francisco	-			
RG_GHCKD_WS_LAEMP_GC_2022-09_NP-NAL	RG_GHCKD	ws		2022/09/15	13:40	G	2		1	1									
RG_FODGH_WS_LAEMP_GC_2022-09_N	RG_FODGH	ws		2022/09/18	9:00	G	1	1											
RG_FODGH_WS_LAEMP_GC_2022-09_NP-NAL	RG_FODGH	ws		2022/09/18	9:00	G	2		1	1									
RG_RIVER_WS_LAEMP_GC_2022-09_N	RG_RIVER	ws		2022/09/12	7:44	G	1	1										1	
RG_RIVER_WS_LAEMP_GC_2022-09_NP-NAL	RG_RIVER	ws		2022/09/12	7:44	G	2		1	1									
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CEDITOR DESCRIPTION	Allera and Apple Break													4	9 "				
SERVICE REQUEST (rush - su	abject to availability) Regular (	default			T	T					1		T-						
	-3 business days) - 50% su	rcharge X		Sampler's	Name			ennifer l	-		Mo	bile#			51	19-500-3	444		
	1 Business Day) - 100% su			Sampler's Si	gnature		~ *	mun I ph	7		Date	/Time			Septe	ember 1	9, 2022		
For Emergency <1 Day, A	ASAP or Weekend - Cont	act ALS	1																

STRAIGHT BILL OF LADING NOT NEGOTIABLE



NO. 95583

Sparwood, BC Terrace, BC Red Deer, AB Vancouver, BC Calgary, AB Montreal, QC Prince George, BC Edmonton, AB Spokane, WA Elkford, BC Ft. McMurray, AB Shelby, MT

Tumbler Ridge, BC Hinton, AB Gillette, WY

INVOICE TO					No. of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of the last of
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BAL Final Report 2209284

No. 95583

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Elkford, BC Ft. McMurray, AB Shelby, MT

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Cooler ID: Cooler 4	COC (Y/N) Temperature: - 0.3	IR:
Coolant Type: Ice	Blue Ice Ambient	
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Effective 7/29/20



October 6, 2022

Teck Resources Limited – Vancouver Giovanna Diaz 421 Pine Avenue Sparwood, B.C. CANADA V0B2G1 giovanna.diaz@teck.com

Re: Regional Effects Program

Dear Giovanna Diaz,

On September 29, 2022, Brooks Applied Labs (BAL) received two (2) aqueous samples. The samples were logged-in for total recoverable selenium [Se], dissolved Se [Se], and Se speciation analyses, according to the chain-of-custody (COC) form.

The sample fractions for total recoverable Se and dissolved Se were not preserved in the field. The samples were preserved (pH < 2) upon receipt at BAL. All sample fractions for total recoverable Se and dissolved Se were preserved within the (14 calendar day) preservation holding time.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

#### Total Recoverable and Dissolved Se

Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

#### Selenium Speciation

Each aqueous sample was analyzed for selenium speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(IV)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(VI)], selenomethionine [SeMet], selenosulfate [SeSO3], and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk SeSp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

In instances where a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries, and the relative percent difference (RPD) values are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

Except for concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited meet all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Jeremy Maute

Senior Project Manager

Jeremy@brooksapplied.com

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Report Information

#### **Laboratory Accreditation**

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <a href="http://www.brooksapplied.com/resources/certificates-permits/">http://www.brooksapplied.com/resources/certificates-permits/</a> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

#### **Field Quality Control Samples**

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

#### **Common Abbreviations**

AR	as received	MS	matrix spike
BAL	Brooks Applied Labs	MSD	matrix spike duplicate
BLK	method blank	ND	non-detect
BS	blank spike	NR	non-reportable
CAL	calibration standard	N/C	not calculated
CCB	continuing calibration blank	PS	post preparation spike
CCV	continuing calibration verification	REC	percent recovery
COC	chain of custody record	RPD	relative percent difference
D	dissolved fraction	SCV	secondary calibration verification
DUP	duplicate	SOP	standard operating procedure
IBL	instrument blank	SRM	reference material
ICV	initial calibration verification	T	total fraction
MDL	method detection limit	TR	total recoverable fraction
MRL	method reporting limit		

#### **Definition of Data Qualifiers**

(Effective 3/23/2020)

- E An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
- Holding time and/or preservation requirements not met. Please see narrative for explanation.
- J Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
- **J-1** Estimated value. A full explanation is presented in the narrative.
- **M** Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
- **N** Spike recovery was not within acceptance criteria. Please see narrative for explanation.
- **R** Rejected, unusable value. A full explanation is presented in the narrative.
- U Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
- X Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
- **Z** Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA <u>SOW ILM03.0</u>, Exhibit B, Section III, pg. B-18, and the <u>USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010</u>. These supersede all previous qualifiers ever employed by BAL.

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## **Accreditation Information**

## Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)

Issued on: July 1, 2021; Valid to: June 30, 2022 Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## **Accreditation Information**

# Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)				
EPA 1638 Mod EPA 200.8 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn				
EPA 6020 Mod						
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)				
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)				
EPA 1631E Mod	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury				
BAL-3100	, , ,					
EPA 1630 Mod	Non-Potable Waters, Solids/Chemicals	Methyl Mercury				
BAL-3200	Biological	,				
EPA 1632A Mod	Non-Potable Waters	Inorganic Arsenic (ISO Only)				
BAL-3300	Biological/Food	In agree and Agree (100 Oak)				
	Solids/Chemicals	Inorganic Arsenic (ISO Only)				
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb				
B	Non-Potable Waters	As(III), As(V), DMAs, MMAs				
BAL-4100	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)				
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)				
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet				
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)				
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)				
SM2340B	Non-Potable Waters	Hardness				
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight				



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_GHP_WS_LAEMP_GC_2022-09	2209379-01	WS	Sample	09/19/2022	09/29/2022
_N RG_GHP_WS_LAEMP_GC_2022-09 NP-NAL	2209379-02	WS	Sample	09/19/2022	09/29/2022
RG_GHP_WS_LAEMP_GC_2022-09 _NP-NAL	2209379-03	WS	Sample	09/19/2022	09/29/2022

# **Batch Summary**

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
MeSe(IV)	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
MeSe(VI)	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
Se	Water	EPA 1638 Mod	09/30/2022	10/04/2022	B222268	S221024
Se(IV)	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
Se(VI)	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
SeCN	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
SeMet	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
SeSO3	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013
Unk Se Sp	Water	SOP BAL-4201	09/29/2022	09/30/2022	B222221	S221013

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_GHP_WS_	LAEMP_GC_2	022-09_N								
2209379-01	DMSeO	WS	D	0.118		0.010	0.025	μg/L	B222221	S221013
2209379-01	MeSe(IV)	WS	D	0.079		0.010	0.025	μg/L	B222221	S221013
2209379-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222221	S221013
2209379-01	Se(IV)	WS	D	2.63		0.020	0.075	μg/L	B222221	S221013
2209379-01	Se(VI)	WS	D	129		0.010	0.055	μg/L	B222221	S221013
2209379-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	μg/L	B222221	S221013
2209379-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	μg/L	B222221	S221013
2209379-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	μg/L	B222221	S221013
2209379-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	μg/L	B222221	S221013
RG GHP WS LAEMP GC 2022-09 NP-NAL										
2209379-02	Se	WS	D	135		0.165	0.528	μg/L	B222268	S221024
RG_GHP_WS_	LAEMP_GC_2	022-09_NP-NAL								
2209379-03	Se	WS	TR	129		0.165	0.528	μg/L	B222268	S221024



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Accuracy & Precision Summary

Batch: B222221 Lab Matrix: Water Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B222221-BS1	Blank Spike, (2236035)						
	MeSe(IV)		5.095	5.499	μg/L	108% 75-125	
	Se(IV)		5.000	5.194	μg/L	104% 75-125	
	Se(VI)		5.000	4.839	μg/L	97% 75-125	
	SeCN		5.015	4.817	μg/L	96% 75-125	
	SeMet		4.982	4.857	μg/L	97% 75-125	
B222221-DUP4	Duplicate, (2209376-10)						
	DMSeO	ND		ND	μg/L		N/C 25
	MeSe(IV)	ND		ND	μg/L		N/C 25
	MeSe(VI)	ND		ND	μg/L		N/C 25
	Se(IV)	0.073		0.067	μg/L		7% 25
	Se(VI)	134.8		135.1	μg/L		0.2% 25
	SeCN	ND		ND	μg/L		N/C 25
	SeMet	ND		ND	μg/L		N/C 25
	SeSO3	ND		ND	μg/L		N/C 25
	Unk Se Sp	ND		ND	μg/L		N/C 25
B222221-MS4	Matrix Spike, (2209376-1	0)					
	Se(IV)	0.073	4.900	4.437	μg/L	89% 75-125	
	Se(VI)	134.8	5.100	140.5	μg/L	NR 75-125	
	SeCN	ND	1.962	1.766	μg/L	90% 75-125	
	SeMet	ND	1.977	1.920	μg/L	97% 75-125	
B222221-MSD4	Matrix Spike Duplicate, (	2209376-10	)				
	Se(IV)	0.073	4.900	4.348	μg/L	87% 75-125	2% 25
	Se(VI)	134.8	5.100	138.8	μg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.769	μg/L	90% 75-125	0.2% 25
	SeMet	ND	1.977	1.864	μg/L	94% 75-125	3% 25



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Accuracy & Precision Summary

Batch: B222268 Lab Matrix: Water Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limit	s RPD & Limits
B222268-BS1	Blank Spike, (2128023) Se		200.0	170.2	μg/L	85% 75-12	25
B222268-BS2	Blank Spike, (2128023) Se		200.0	157.6	μg/L	79% 75-12	25
B222268-BS3	Blank Spike, (2128023) Se		200.0	178.1	μg/L	89% 75-12	25
B222268-SRM1	Reference Material (221401	16, TMDA 5				•	
	Se		14.30	11.10	μg/L	78% 75-12	25
B222268-SRM2	Reference Material (221401	16, TMDA 5				•	-
	Se		14.30	11.88	μg/L	83% 75-12	25
B222268-SRM3	Reference Material (221401	16, TMDA 5				•	
	Se		14.30	11.92	μg/L	83% 75-12	25
B222268-DUP4	Duplicate, (2209378-03)	22.27		50.70			20/ 02
	Se	60.07		56.79	μg/L		6% 20
B222268-MS4	Matrix Spike, (2209378-03)		000.0	070.4		070/ 75 44	-
	Se	60.07	220.0	273.4	μg/L	97% 75-12	<b>2</b> 5
B222268-MSD4	Matrix Spike Duplicate, (22			040.0	//	000/ 75 4/	100/ 00
	Se	60.07	220.0	248.3	μg/L	86% 75-12	25 10% 20



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

Batch: B222221 Matrix: Water

Method: SOP BAL-4201 Analyte: DMSeO

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

Average: 0.000 MDL: 0.002 Limit: 0.005 MRL: 0.005



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

	Analyte:	Se	(IV)	
--	----------	----	------	--

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

**Average**: 0.000 **MDL**: 0.004 **Limit**: 0.015 **MRL**: 0.015

## Analyte: Se(VI)

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

#### Analyte: SeCN

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.010
 MRL: 0.010

## Analyte: SeMet

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BI K4	0.00	ua/l

 Average: 0.000
 MDL: 0.002

 Limit: 0.005
 MRL: 0.005

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.011
 MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B222221-BLK1	0.00	μg/L
B222221-BLK2	0.00	μg/L
B222221-BLK3	0.00	μg/L
B222221-BLK4	0.00	μg/L

 Average: 0.000
 MDL: 0.002

 Limit: 0.015
 MRL: 0.015

**Project ID:** TRL-VC2101 **PM:** Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

# Method Blanks & Reporting Limits

Batch: B222268 Matrix: Water

Method: EPA 1638 Mod

Analyte: Se

Sample	Result	Units
B222268-BLK1	0.027	μg/L
B222268-BLK2	0.095	μg/L
B222268-BLK3	-0.028	μg/L
B222268-BLK4	0.019	μg/L

 Average: 0.028
 MDL: 0.150

 Limit: 0.480
 MRL: 0.480

**Project ID**: TRL-VC2101 **PM**: Jeremy Maute



BAL Final Report 2209379
Client PM: Giovanna Diaz
Client Project: Regional Effects Program

## Sample Containers

	ID: 2209379-01 ple: RG_GHP_WS_LAEMP_	GC 2022-09 N		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/19/2022 ived: 09/29/2022
Des		Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
Α	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler 1 - 2209379
В	XTRA_VOL	15 mL	na	none	na	na	Cooler 1 - 2209379
С	XTRA_VOL	125 mL	na	none	na	na	Cooler 1 - 2209379
Sam	ID: 2209379-02 ple: GHP_WS_LAEMP_GC_202:	2-09_NP-NAL		Report Matrix: WS Sample Type: Sample + Sum			cted: 09/19/2022 ived: 09/29/2022
Sam	ple: GHP_WS_LAEMP_GC_202	2-09_NP-NAL Size	Lot	•	P-Lot		
Sam RG_	ple: GHP_WS_LAEMP_GC_202:	<del>-</del>	Lot na	Sample Type: Sample + Sum	P-Lot 2037003	Rece	ived: 09/29/2022
Sam RG_ Des A	ple: GHP_WS_LAEMP_GC_202: Container Client-Provided - TM	Size 40 mL		Sample Type: Sample + Sum  Preservation		Rece pH <2	ived: 09/29/2022 Ship. Cont. Cooler 1 -

## **Shipping Containers**

10% HNO3 (BAL)

2037003

<2

Cooler 1 -

2209379

Cooler 1 - 2209379

**Received:** September 29, 2022 7:07 **Tracking No:** RWHV95589 via Courier

Client-Provided - TM

40 mL

na

Coolant Type: Ice Temperature: -1.4 °C Description: Styrofoam Cooler Damaged in transit? No Returned to client? No Comments: IR#:2 Custody seals present? No Custody seals intact? No COC present? Yes

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	Jennifer Ings/Minnow	N DATE/FIME	MW 1PM	9/29/22 70
SERVICE REQUEST (rush - subject to availability)				
Regular (default) Priority (2-3 business days) - 50% surcharge X	Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Emergency (1 Business Day) - 100% surcharge For Emergency <1 Day, ASAP or Weekend - Contact ALS	Sampler's Signature	Land Bro	Date/Time	September 26, 2022

STRAIGHT BILL OF LADING NOT NEGOTIABLE



No. 95589

Sparwood, BC Terrace, BC Red Deer, AB Vancouver, BC Calgary, AB Montreal, QC Prince George, BC Edmonton, AB Spokane, WA

Elkford, BC Ft. McMurray, AB Shelby, MT Tumbler Ridge, BC Hinton, AB Gillette, WY

INVOICE TO		CAP				DATE
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DRIVER'S SIGNA	ATURE - PICK UP BY	PICK UP TIME	DRIVER'S S GNATUR	E · DELIVERY BY	FINISH TIME	GST
NOTICE OF CLAIM (18) N	corner is liable for loss, damage or defay of a	ny goods under the Bill of Lading unless notice carrier or the deliver no carrier within sixty (60	e, therefor setting out particulars of the c	ongen us a near in terr date of ship	oment of the goods and the estimated amount claim	mad in
b)The final state of RECEIVED at the po- destined is indical of its mutually agreed to	of the claim must be filed within the consonor the which the carrier agrees to be a which the carrier agrees to be a set of at or any of the goods over all	nine (9) month: from the date of pantoned herein the property herein describ, arry and to detiver to the consigned my portion of the route to destination, and a	shipment ingether with a cop- er in apparent go, order, excert as n of at the said destination, tubje as to ear party of any time interested in	y of the pair freight bill oleo cock ints and condition of o icl to the rates and classifi all or any of the pure's that ever	ment of the goods and the estimated amount claim- very within nine (9) months from the date of shipm anihets of package unknown) manued, consigned of fication in effect on the date of shipmen y service to be performed hereunder shall be subju- ir viol sade by the standard Bill of Lading, in power it in such conditions.	TOTAL \$
	the proofs listed in Bill of Leding is now	sum are nevero agreed by the consignor and a signor and accepted for himself and remed by regulation in force in the jurisdiction		nted or writter in building or indition set ou	n sot aside by the standard Bill of Lading, in power it in such conditions	
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	TE Office YELLOW Carr	PINK: Consignee	GOLDENROAD Shinpe	GST#	864540398RT0001	NUMBER OF PIECES RECEIVED
GCC PRINTING				des - 1		

Cooler ID: Couler 1

COC (Y/N)

Temperature: 4

IR: 2

Coolant Type:

(ice

Blue Ice

**Ambient** 

Notes:

**Sampling Locations:** 

Sample Types:

**Container Types:** 

Opened By: WW

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Date:

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COP Revision 004

Effective 7/29/20



# CORDILLERA - BENTHIC INVERTEBRATE COMMUNITY

## **Methods and QC Report 2023**

Project ID: 22-16 (GC LAEMP)

Client: Minnow Environmental



P: 250.494.7553

F: 250.494.7562

## Prepared by:

Cordillera Consulting Inc. Summerland, BC © 2023

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## Sample Reception

On September 29, 2022, Cordillera Consulting received 6 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_GHNF_BIC-1_2022-09-09_N	CC231330	9-Sep-22	400μΜ	2
RG_GHNF_BIC-3_2022-09-10_N	CC231331	10-Sep-22	400μΜ	1
RG_GHNF_BIC-5_2022-09-10_N	CC231332	10-Sep-22	400μΜ	4
RG_GHDT_BIC-1_2022-09-16_N	CC231333	16-Sep-22	400μΜ	1
RG_GHDT_BIC-3_2022-09-16_N	CC231334	16-Sep-22	400μΜ	1
RG_GHDT_BIC-5_2022-09-16_N	CC231335	16-Sep-22	400μΜ	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.

Sample	Date	CC#	400 micron fraction	
				#
			% Sampled	Invertebrates
RG_GHNF_BIC-1_2022-09-09_N	9-Sep-22	CC231330	19%	311
RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	100%	344
RG_GHNF_BIC-5_2022-09-10_N	10-Sep-22	CC231332	5%	542
RG_GHDT_BIC-1_2022-09-16_N	16-Sep-22	CC231333	100%	322
RG GHDT RIC-3 2022-09-16 N	16-Sen-22	CC23133/	50%	357

CC231335

100%

327

Table 2: Percent sub-sample and invertebrate count for each sample

## **Sorting Quality Control - Sorting Efficiency**

RG GHDT BIC-5 2022-09-16 N | 16-Sep-22

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:

$$\frac{\#OrganismsMissed}{TotalOrganismsFound}*100 = \%OM$$

	f	Fotal From Sample	Percent Efficiency
Site - QC, Sample - QC 1, CC# - CC231333, Percent sampled = 1		·	= 400
Chironomidae	4		_
Plecoptera	2		
Empididae	1		
Ephemerellidae	1		
Diptera	1		
Total:	9	322	97.20%

## **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 subsamples 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 subsample 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**

S	tation ID		Organisms in Subsample						Sc	orter		Preci	sion	Accu	ıracy													
CC#	Sample Name		Organisms in Subsample					ı Bv	Tot		Actual By Time Total		Percent Range M		Min	Max												
CC#	Sample Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Бу	y Time Total		Percent Kange		IVIIII	IVIdX
	RG_GHDT_BIC- 3 2022-09-	354	358																			MP	60					
231334	16_N																							712	1.12	1.12	0.56	0.56

### **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 manual¹, SAFIT², and PNAMP³ 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 reenumeration 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:

$$\frac{\textit{Sum of incorrect identifications}}{\textit{total organisms counted in audit}}*(100)$$

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.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_i + S_i}$$

## **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

% Error  PDE  PTD  PTD  Bray - Curtis Dissimilarity index
-----------------------------------------------------------

Site

Site - 2022, Sample - RG_GHNF_BIC-3_2022-09-10_N, CC# - CC231331, Percent sampled = 100%, Sieve size = 400

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 - 2022, Sample - RG_GHNF_BIC-3_2022-09- 10_N, CC# - CC231331, Percent sampled = 100%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Capniidae	27	27						
Chironomidae	9	9						
Collembola	2	2						
Corynoneura	1	1						
Dicranota	8	8						
Empididae	2	2						
Glutops	4	4						
Hydrobaenus	90	91	No			Χ		

Isoperla	4	4		
Lebertia	2	2		
Limnephilidae	44	44		
Limnophyes	2	2		
Megarcys	1	1		
Mesocapnia	2	2		
Micropsectra	1	1		
Monodiamesa	1	1		
Nemouridae	2	2		
Neoplasta	21	21		
Oribatida	1	1		
Pagastia	5	5		
Parametriocnemus	1	1		
Pericoma/Telmatoscopus	27	28	No	Χ
Perlodidae	34	34		
Pseudodiamesa	28	28		
Rhyacophila	1	1		
Trichoptera	4	4		
	•	•		
Tubificinae with hair				
chaetae	2	2		
chaetae Tubificinae without hair	2	2		
chaetae Tubificinae without hair chaetae	2	2 7		
chaetae Tubificinae without hair	2	2		

Total:	344	346						
					0	2	0	
% Total Misidentification	misidentifications	x100 =	0.00	Pass				
Rate =	total number	X100 =						

## References

## **Taxonomic Keys**

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

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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# CORDILLERA CONSULTING - FESHWATER INVERTERATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
Jite.	2022	2022	LULL	LULL	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
Sample:			5_2022-09-10_N			
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
	00201000	00201001	00202002	00202000	0020100 .	00201000
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: Ephemerellidae	11	0	0	0	0	1
· · ·						
Order: Plecoptera	53	0	20	6	24	1
Family: Capniidae	442	27	500	22	34	18
Mesocapnia	5	2	0	0	0	0
Family: Chloroperlidae	47	0	0	1	2	6
Sweltsa	16	0	0	0	0	2
Family: Nemouridae	37	2	40	1	10	4
Malenka	5	0	0	0	0	0
Zapada	0	0	0	12	16	17
Zapada cinctipes	5	0	0	15	0	6
Family: Perlodidae	332	34	1060	21	68	5
Isoperla	0	4	20	0	2	1
Kogotus	0	0	0	0	0	1
Megarcys	0	1	60	5	8	10
Family: Taeniopterygidae	0	0	0	2	46	15
Order: Trichoptera	0	4	0	0	0	0
Family: Hydropsychidae	0	0	0	0	2	0
Family: Limnephilidae	42	44	0	3	0	2
Ecclisomyia	0	0	0	1	0	1
Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	0	1	0	0	0	0
Rhyacophila betteni group	0	0	0	0	2	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	5
Rhyacophila narvae	0	0	0	1	0	5
Rhyacophila vofixa group	0	0	0	2	0	0
10.1.00						
Order: Diptera	0	0	0	0	4	0
Family: Chironomidae	32	9	580	20	62	20
Subfamily: Chironominae	0	0	0	0	0	0
Tribe: Tanytarsini	0	0	0	0	0	0
Micropsectra	0	1	20	2	4	0
Subfamily: Diamesinae	0	0	0	0	0	0
Tribe: Diamesini	0	0	0 740	0 34	0	0
Pagastia Pseudodiamesa	63	5 28		7	58	28 3
Pseudodiamesa	84		380		4	
Subfamily: Orthocladiinae	0	0	0	0	0	0
Brillia Corynoneura	0	0	40	0	0	0
	0	0	0	0		0 78
Eukiefferiella	5	U	20	101	168	78



# CORDILLERA CONSULTING - FESHWATER INVERTERATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
Sample:	1_2022-09-09_N	3_2022-09-10_N	5_2022-09-10_N	1_2022-09-16_N	3_2022-09-16_N	5_2022-09-16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Hydrobaenus	53	90	580	9	4	16
Limnophyes	0	2	0	0	0	0
Orthocladius complex	0	0	100	9	46	5
Parametriocnemus	0	1	40	0	0	0
Tvetenia	195	4	6180	22	90	17
Subfamily: Prodiamesinae	0	0	0	0	0	0
Monodiamesa	0	1	0	0	0	0
Subfamily: Tanypodinae	0	0	0	0	0	0
Ablabesmyia	0	0	0	1	0	0
Zavrelimyia	11	7	0	1	0	2
Family: Dixidae	0	0	0	0	0	0
Dixa	0	0	0	0	0	1
Family: Empididae	16	2	60	1	6	1
Neoplasta	105	21	40	11	32	29
Trichoclinocera	5	0	0	0	0	0
Family: Limoniidae	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	1
Family: Muscidae	0	0	0	0	0	0
Limnophora	0	0	20	0	0	0
Family: Pelecorhynchidae	0	0	0	0	0	0
Glutops	11	4	0	0	0	5
Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	21	27	200	6	2	10
Family: Tipulidae	0	0	0	0	0	0
Dicranota	11	8	20	2	4	2
London Collegebole	0	2	0	4	2	2
Order: Collembola	0	2	0	1	2	2
Subphylum: Chelicerata	0	0	0	0	0	0
Class: Arachnida	0	0	0	0	0	0
Order: Trombidiformes	0	0	0	0	0	0
Family: Lebertiidae	0	0	0	0	0	0
Lebertia	0	2	0	0	0	2
Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	0	0	0	2	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: Tubificida	0	0	0	0	0	0
Family: Enchytraeidae	0	0	0	0	8	0
Enchytraeus	21	0	0	0	0	2
Family: Naididae	0	0	0	0	0	0
Subfamily: Tubificinae with hair chaetae	0	2	0	0	0	0
Subfamily: Tubificinae without hair chaet	11	7	120	0	0	0



# CORDILLERA CONSULTING - RESHWATER INVERTERRATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

250-494-7553

Site:	2022	2022	2022	2022	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
Sample:	1_2022-09-09_N	3_2022-09-10_N	5_2022-09-10_N	1_2022-09-16_N	3_2022-09-16_N	5_2022-09-16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Order: Oribatida	0	1	0	0	4	1
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	0	0	0	1	0	0
Class: Gastropoda	0	0	0	1	0	2
Order: Hypsogastropoda	0	0	0	0	0	0
Family: Hydrobiidae	0	0	0	1	0	0
Totals:	1639	344	10840	322	714	327

#### Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0
Class: Copepoda	0	1	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
Class: Ostracoda	5	1	20	1	2	1
Phylum: Nemata	5	1	0	0	2	1
Phylum: Platyhelminthes	0	0	0	0	0	0
Class: Turbellaria	5	1	20	1	2	1
Totals:	15	4	40	2	6	3



# CORDILLERA CONSULTING - FESHWATER INVERTERATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
Jite.	2022	2022	2022	2022	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
Sample:			5_2022-09-10_N			
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
	00201000	00202002	00202002	00202000	0020200 :	00201000
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: Ephemerellidae	11	0	0	0	0	1
. , ,						
Order: Plecoptera	53	0	20	6	24	1
Family: Capniidae	447	29	500	22	34	18
Family: Chloroperlidae	63	0	0	1	2	8
Family: Nemouridae	47	2	40	28	26	27
Family: Perlodidae	332	39	1140	26	78	17
Family: Taeniopterygidae	0	0	0	2	46	15
Order: Trichoptera	0	4	0	0	0	0
Family: Hydropsychidae	0	0	0	0	2	0
Family: Limnephilidae	42	44	0	4	0	3
Family: Rhyacophilidae	0	1	0	3	2	10
Order: Diptera	0	0	0	0	4	0
Family: Chironomidae	443	149	8680	206	436	169
Family: Dixidae	0	0	0	0	0	1
Family: Empididae	126	23	100	12	38	30
Family: Limoniidae	0	0	0	0	0	1
Family: Muscidae	0	0	20	0	0	0
Family: Pelecorhynchidae	11	4	0	0	0	5
Family: Psychodidae	21	27	200	6	2	10
Family: Tipulidae	11	8	20	2	4	2
L Oudery Cellerak ele		2	-			2
Order: Collembola	0	2	0	1	2	2
Cubabuluma Challagest	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0
Class: Arachnida   Order: Trombidiformes	0	0	0	0	0	0
Family: Lebertiidae	0	2	0	0	0	2
Family: Lebertidae	0	0	0	0	2	0
1 ranniy. Sperchondidae	J	J	0	0	2	J
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: Tubificida	0	0	0	0	0	0
Family: Enchytraeidae	21	0	0	0	8	2
Family: Naididae	11	9	120	0	0	0
1						,
Order: Oribatida	0	1	0	0	4	1
·						



CORDILLERA CONSULTING - RESHWATER INVERTERRATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

250-494-7553

Site:	2022	2022	2022	2022	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
Sample:	1_2022-09-09_N	3_2022-09-10_N	5_2022-09-10_N	1_2022-09-16_N	3_2022-09-16_N	5_2022-09-16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
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	0	0	0	1	0	0
Class: Gastropoda	0	0	0	1	0	2
Order: Hypsogastropoda	0	0	0	0	0	0
Family: Hydrobiidae	0	0	0	1	0	0
Totals:	1639	344	10840	322	714	327

## Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0
Class: Copepoda	0	1	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
Class: Ostracoda	5	1	20	1	2	1
Phylum: Nemata	5	1	0	0	2	1
Phylum: Platyhelminthes	0	0	0	0	0	0
Class: Turbellaria	5	1	20	1	2	1
Totals:	15	4	40	2	6	3



# CORDILLERA CONSULTING FRESHWATER INVERTEBRATE TAXONOMY

**Project: 22-16 (GC LAEMP) (Formerly GGCAMP)** 

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

	2022	2022	2022	2022	2022	2022
Site	2022	2022	2022	2022	2022	2022
	RG_GHNF_BI	RG_GHNF_B	RG_GHNF_BI	RG_GHDT_	RG_GHDT_	RG_GHDT_B
Sample	C-1_2022-09-	IC-3_2022-	C-5_2022-09-	BIC-1_2022-	BIC-3_2022-	IC-5_2022-
	09_N	09-10_N	10_N	09-16_N	09-16_N	09-16_N
Sample Collection Date	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#	•	CC231331	CC231332	CC231333	CC231334	CC231335
Richness Measures						
Species Richness	22	28	18	28	25	33
EPT Richness	9	7	4	12	9	15
Ephemeroptera Richness	1	0	0	0	0	1
Plecoptera Richness	7	5	4	8	7	10
Trichoptera Richness	1	2	0	4	2	4
Chironomidae Richness	6	11	9	9	7	7
Oligochaeta Richness	2	2	1	0	1	1
Non-Chiro. Non-Olig. Richness	14	15	8	19	17	25
Abundance Measures						
Corrected Abundance	1639	344	10840	322	714	327
EPT Abundance	905	81	620	86	122	94
Dominance Measures						
1st Dominant Taxon	Capniidae	Hydrobaenu	Tvetenia	Eukiefferiella	Eukiefferiella	Eukiefferiella
1st Dominant Abundance	442	90	6180	101	168	78
2nd Dominant Taxon	Perlodidae	Limnephilida	Perlodidae	Pagastia	Tvetenia	Neoplasta
2nd Dominant Abundance	332	44	1060	34	90	29
3rd Dominant Taxon	Tvetenia	Perlodidae	Pagastia	Tvetenia	Perlodidae	Pagastia
3rd Dominant Abundance	195	34	740	22	68	28
% 1 Dominant Taxon	26.97%	26.16%	57.01%	31.37%	23.53%	23.85%
% 2 Dominant Taxon	20.26%	12.79%	9.78%	10.56%	12.61%	8.87%
% 3 Dominant Taxon	11.90%	9.88%	6.83%	6.83%	9.52%	8.56%
Percent Dominance	59.13%	48.83%	73.62%	48.76%	45.66%	41.28%
Community Composition						
% Ephemeroptera	0.67%	0.00%	0.00%	0.00%	0.00%	0.31%
% Plecoptera	51.98%	10.47%	5.72%	24.53%	16.53%	24.46%
% Trichoptera	2.56%	13.08%	0.00%	2.17%	0.56%	3.98%
% EPT	55.22%	23.55%	5.72%	26.71%	17.09%	28.75%
% Diptera	34.41%	61.34%	77.31%	63.66%	59.66%	60.24%
% Oligochaeta	1.95%	2.62%	1.11%	0.00%	1.12%	0.61%
% Baetidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Chironomidae	25.08%	45.93%	74.72%	57.76%	52.38%	45.57%
% Odonata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%



# CORDILLERA CONSULTING FRESHWATER INVERTEBRATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
	RG GHNF BI	RG GHNF E	RG_GHNF_BI	RG GHDT	RG GHDT	RG GHDT B
Sample:	C-1_2022-09-	IC-3_2022-	C-5_2022-09	- BIC-1_2022-	BIC-3_2022-	IC-5_2022-
	09_N	09-10_N	10_N	09-16_N	09-16_N	09-16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Functional Group Composition						
% Predators	6.41%	24.71%	0.59%	13.98%	9.10%	23.85%
% Shredder-Herbivores	5.74%	9.01%	0.27%	16.15%	7.42%	18.35%
% Collector-Gatherers	5.80%	62.50%	3.86%	29.19%	15.27%	26.61%
% Scrapers	0.00%	0.00%	0.00%	0.62%	0.00%	0.61%
% Macrophyte-Herbivore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Collector-Filterer	0.00%	0.00%	0.00%	0.31%	0.14%	0.00%
% Omnivore	0.06%	0.00%	0.01%	31.68%	11.76%	24.16%
% Parasite	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Piercer-Herbivore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Gatherer	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Unclassified	0.98%	3.78%	0.28%	8.07%	6.30%	6.42%
Functional Group Richness						
Predators Richness	9	11	L 8	9	10	16
Shredder-Herbivores Richness	5				4	5
Collector-Gatherers Richness	9					11
Scrapers Richness	J	1-	•	2		1
MH Richness				_		-
CF Richness				1	1	
OM Richness	1		1			2
PA Richness	_		_	_	_	_
Piercer-Herbivore Richness						
Gatherer Richness						
Unclassified	2	2	2 2	. 2	3	2
Voltinism Composition						
% Univoltine	2.26%	4.65%	0.92%	5.59%	1.68%	3.06%
% Semivoltine	0.98%	0.00%	0.00%	0.00%	0.00%	0.61%
% Multivoltine	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Voltinism Richness						
Univoltine	3	4	1 2	. 2	3	3
Semivoltine	1	(	) 0	0	0	1
Multivoltine	0	(	) 0	0	0	0



CORDILLERA CONSULTING FRESHWATER INVERTEBRATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
Sample:	RG_GHNF_BI C-1_2022-09- 09_N		RG_GHNF_BI C-5_2022-09- 10_N			
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Diversity/Evenness Measures						
Shannon-Weiner H' (log 10)	1.05	1.11	0.73	1.11	1.12	1.25
Shannon-Weiner H' (log 2)	3.49	3.69	2.43	3.7	3.71	4.15
Shannon-Weiner H' (log e)	2.42	2.56	1.68	2.56	2.57	2.88
Simpson's Index (D)	0.14	0.12	0.35	0.14	0.11	0.09
Simpson's Index of Diversity (1 - D)	0.86	0.88	0.65	0.86	0.89	0.91
Simpson's Reciprocal Index (1/D)	7.06	8.31	2.87	7.41	9.14	10.74
Biotic Indices						
Hilsenhoff Biotic Index	3.12	5.21	4.53	4.96	4.83	4.77



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Stan	2022	2022	2022	2022	2022	2022
Site:	2022	2022	2022	2022	2022	2022
	DC CUNE DIC	DC CUNE DIC	DC CUNE DIC	DC CUDT DIC	DC CUDT DIC	DC CUDT DIC
Canada	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
			5_2022-09-10_N			
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
Richness Measures	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Species Richness	14	15	10	16	17	21
EPT Richness	1	0	0	0	0	1
Ephemeroptera Richness	1	0	0	U	0	1
Plecoptera Richness	тт					1
Trichoptera Richness						
Chironomidae Richness	1	1	1	1	1	1
	2	1	1		1	1
Oligochaeta Richness Non-Chiro. Non-Olig. Richness	11	13	8	15	15	19
Non-Chiro. Non-Olig. Richness	11	15	٥	15	15	19
Abundance Measures						
Corrected Abundance	1639	344	10840	322	714	327
EPT Abundance	995	119	1700	92	214	100
El i / Ibulidance	333	113	1700	52	214	100
Dominance Measures						
1st Dominant Taxon	Capniidae	Chironomidae	Chironomidae	Chironomidae	Chironomidae	Chironomidae
1st Dominant Abundance	447	149	8680	206	436	169
2nd Dominant Taxon	Chironomidae	Limnephilidae	Perlodidae	Nemouridae	Perlodidae	Empididae
2nd Dominant Abundance	443	44	1140	28	78	30
3rd Dominant Taxon	Perlodidae	Perlodidae	Capniidae	Perlodidae	Taeniopterygidae	
3rd Dominant Abundance	332	39	500	26	46	27
% 1 Dominant Taxon	27.27%	43.31%	80.07%	63.98%	61.06%	51.68%
% 2 Dominant Taxon	27.03%	12.79%	10.52%	8.70%	10.92%	9.17%
% 3 Dominant Taxon	20.26%	11.34%	4.61%	8.07%	6.44%	8.26%
Percent Dominance	74.56%	67.44%	95.20%	80.75%	78.42%	69.11%
		5111111	0012071			001227
Community Composition						
% Ephemeroptera	0.67%	0.00%	0.00%	0.00%	0.00%	0.31%
% Plecoptera	57.47%	20.35%	15.68%	26.40%	29.41%	26.30%
% Trichoptera	2.56%	14.24%	0.00%	2.17%	0.56%	3.98%
% EPT	60.71%	34.59%	15.68%	28.57%	29.97%	30.58%
% Diptera	37.34%	61.34%	83.21%	70.19%	67.79%	66.67%
% Oligochaeta	1.95%	2.62%	1.11%	0.00%	1.12%	0.61%
% Baetidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Chironomidae	27.03%	43.31%	80.07%	63.98%	61.06%	51.68%
% Odonata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Functional Group Composition						
% Predators	32.46%	20.35%	11.62%	13.04%	17.37%	22.32%
% Shredder-Herbivores	30.81%	11.34%	5.17%	16.77%	15.41%	18.96%
% Collector-Gatherers	6.47%	23.84%	2.95%	3.42%	1.68%	5.50%
% Scrapers	0.00%	0.00%	0.00%	0.62%	0.00%	0.61%
% Macrophyte-Herbivore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Collector-Filterer	0.00%	0.00%	0.00%	0.31%	0.28%	0.00%
% Omnivore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Parasite	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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Site:	2022	2022	2022	2022	2022	2022
	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHNF_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-	RG_GHDT_BIC-
	1_2022-09-09_N	3_2022-09-10_N	5_2022-09-10_N	1_2022-09-16_N	3_2022-09-16_N	5_2022-09-16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC#:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
% Piercer-Herbivore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Gatherer	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Unclassified	30.26%	44.48%	80.26%	65.84%	65.27%	52.60%
Functional Group Richness						
Predators Richness	4	6	3	4	5	7
Shredder-Herbivores Richness	3	3	3	4	4	4
Collector-Gatherers Richness	5	4	2	3	3	5
Scrapers Richness				2		1
MH Richness						
CF Richness				1	1	
OM Richness						
PA Richness						
Piercer-Herbivore Richness						
Gatherer Richness						
Unclassified	2	2	2	2	4	4
Voltinism Composition						
% Univoltine	7.69%	6.69%	0.92%	3.73%	5.32%	9.17%
% Semivoltine	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% Multivoltine	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Voltinism Richness						
Univoltine	0	0	0	0	0	0
Semivoltine	0	0	0	0	0	0
Multivoltine	0	0	0	0	0	0
Diversity/Evenness Measures						
Shannon-Weiner H' (log 10)	1.05	1.11	0.73	1.11	1.12	1.25
Shannon-Weiner H' (log 2)	3.49	3.69	2.43	3.7	3.71	4.15
Shannon-Weiner H' (log e)	2.42	2.56	1.68	2.56	2.57	2.88
Simpson's Index (D)	0.14	0.12	0.35	0.14	0.11	0.09
Simpson's Index of Diversity (1 - D)	0.86	0.88	0.65	0.86	0.89	0.91
Simpson's Reciprocal Index (1/D)	7.06	8.31	2.87	7.41	9.14	10.74
<b>Biotic Indices</b>						
Hilsenhoff Biotic Index	3.12	5.21	4.53	4.96	4.83	4.77



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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Site:	2022		2022		2022		2022		2022		2022	
	RG_GHNF_B		RG_GHNF_B		RG_GHNF_B		RG_GHDT_B		RG_GHDT_B		RG_GHDT_B	
Sample:	1_2022-09-09	)_N	3_2022-09-10	)_N	5_2022-09-10	)_N	1_2022-09-16	_N	3_2022-09-16	_N	5_2022-09-16	)_N
Sample Collection Date:	9-Sep-22		10-Sep-22		10-Sep-22		16-Sep-22		16-Sep-22		16-Sep-22	
CC #:	CC231330	)	CC231331		CC231332		CC231333		CC231334		CC231335	
Sieve Size:	400		400		400		400		400		400	
SubSample %:	19		100		5		100		50		100	
-												
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: Ephemerellidae	2		0		0		0		0		1	
Order: Plecoptera	10	ND	0		1	ND	6	ND	12	ND	1	ND
Family: Capniidae	84	שוו	27		25	שוו	22	שויו	17	שאו	18	IND
Mesocapnia	1		27		0		0		0		0	
Family: Chloroperlidae	9		0		0		1		1		6	
Sweltsa	3		0		0		0		0		2	
Family: Nemouridae	7	ND	2		2		1		5		4	
Malenka	1	IVD	0		0		0		0		0	
Zapada	0		0		0		12		8		17	
Zapada cinctipes	1		0		0		15		0		6	
Family: Perlodidae	63		34	ND	53	ND	21		34	ND	5	ND
	0		4		1		0		1		1	
Kogotus	0		0		0		0		0		1	
Megarcys	0		1		3		5		4		10	
Family: Taeniopterygidae	0		0		0		2		23		15	
Order: Trichoptera	0		4	ND	0		0		0		0	
Family: Hydropsychidae	0		0		0		0		1		0	
Family: Limnephilidae	8		44		0		3		0		2	
Ecclisomyia	0		0		0		1		0		1	
Family: Rhyacophilidae	0		0		0		0		0		0	
Rhyacophila	0		1		0		0		0		0	
Rhyacophila betteni group	0		0		0		0		1		0	
Rhyacophila brunnea/vemna group	0		0		0		0		0		5	
Rhyacophila narvae	0		0		0		1		0		5	
Rhyacophila vofixa group	0		0		0		2		0		0	
Order: Diptera	0		0		0		0		2		0	
Family: Chironomidae	6	ND	9		29	ND		ND	31	ND		ND
Subfamily: Chironominae	0		0		0		0		0		0	
Tribe: Tanytarsini	0		0		0		0		0		0	
Micropsectra	0		1		1		2		2		0	
Subfamily: Diamesinae	0		0		0		0		0		0	
Tribe: Diamesini	0		0		0		0		0		0	
Pagastia	12		5		37		34		29		28	
Pseudodiamesa	16		28		19		7		2		3	



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

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Site:	2022		2022		2022		2022		2022		2022	
	RG_GHNF_B		RG_GHNF_BI 3_2022-09-10		RG_GHNF_B		RG_GHDT_B		RG_GHDT_BI 3_2022-09-16			
Sample:	1_2022-09-03		3_2022-09-10	_'\	3_2022-09-10		1_2022 03 10_11		3_2022 03 10_1		5_2022 05 10_	
Sample Collection Date:	9-Sep-22		10-Sep-22		10-Sep-22		16-Sep-22		16-Sep-22		16-Sep-22	
CC #:	CC231330		CC231331		CC231332		CC231333		CC231334		CC231335	
Sieve Size:	400		400		400		400		400		400	
SubSample %:	19		100		5		100		50		100	
Subfamily: Orthocladiinae	0		0		0		0		0		0	
Brillia	0		0		2		0		0		0	
Corynoneura	0		1		0		0		0		0	
Eukiefferiella	1		0		1		101		84		78	
Hydrobaenus	10		90		29		9		2		16	
Limnophyes	0		2		0		0		0		0	
Orthocladius complex	0		0		5		9		23		5	
Parametriocnemus	0		1		2		0		0		0	
Tvetenia	37		4		309		22		45		17	
Subfamily: Prodiamesinae	0		0		0		0		0		0	
Monodiamesa	0		1		0		0		0		0	
Subfamily: Tanypodinae	0		0		0		0		0		0	
Ablabesmyia	0		0		0		1		0		0	
Zavrelimyia	2		7		0		1		0		2	
Family: Dixidae	0		0		0		0		0		0	
Dixa	0		0		0		0		0		1	
Family: Empididae	3	ND	2		3	ND	1	ND	3		1	ND
Neoplasta	20		21		2		11		16		29	
Trichoclinocera	1		0		0		0		0		0	
Family: Limoniidae	0		0		0		0		0		0	
Eloeophila	0		0		0		0		0		1	
Family: Muscidae	0		0		0		0		0		0	
Limnophora	0		0		1		0		0		0	
Family: Pelecorhynchidae	0		0		0		0		0		0	
Glutops	2		4		0		0		0		5	
Family: Psychodidae	0		0		0		0		0		0	
Pericoma/Telmatoscopus	4		27		10		6		1		10	
Family: Tipulidae	0		0		0		0		0		0	
Dicranota	2		8		1		2		2		2	
Order: Collembola	0		2		0		1		1		2	
·												
Subphylum: Chelicerata	0		0		0		0		0		0	
Class: Arachnida	0		0		0		0		0		0	
Order: Trombidiformes	0		0		0		0		0		0	
Family: Lebertiidae	0		0		0		0		0		0	
Lebertia	0		2		0		0		0		2	
Family: Sperchontidae	0		0		0		0		0		0	
Sperchon	0		0		0		0		1		0	
ope. enon	- 5		<u> </u>		<u> </u>		3		1		<u> </u>	
Phylum: Annelida	0		0		0		0		0		0	
Subphylum: Clitellata	0		0		0		0		0		0	
Class: Oligochaeta	0		0		0		0		0		0	



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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250-494-7553

Site:	2022	2022	2022	2022	2022	2022	
Sample:	RG_GHNF_BIC 1_2022-09-09_		RG_GHNF_B 5_2022-09-10	RG_GHDT_B 1_2022-09-16		RG_GHDT_BI 5_2022-09-16	
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22	
CC #:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335	
Sieve Size:		400	400	400	400	400	
SubSample %:	19	100	5	100	50	100	
Order: Tubificida	0	0	0	0	0	0	
Family: Enchytraeidae	0	0	0	0	4	0	
Enchytraeus	4	0	0	0	0	2	
Family: Naididae	0	0	0	0	0	0	
Subfamily: Tubificinae with hair cha	0	2	0	0	0	0	
Subfamily: Tubificinae without hair	2	7	6	0	0	0	
Order: Oribatida	0	1	0	0	2	1	
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	0	0	0	1	0	0	
Class: Gastropoda	0	0	0	1	0	2	
Order: Hypsogastropoda	0	0	0	0	0	0	
Family: Hydrobiidae	0	0	0	1	0	0	
Totals:	311	344	542	322	357	327	

#### Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0	
Class: Copepoda	0	1	0	0	0	0	
Subphylum: Crustacea	0	0	0	0	0	0	
Class: Ostracoda	1	1	1	1	1	1	
Phylum: Nemata	1	1	0	0	1	1	
Phylum: Platyhelminthes	0	0	0	0	0	0	
Class: Turbellaria	1	1	1	1	1	1	
Totals:	3	4	2	2	3	3	



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:	2022	2022	2022	2022	2022	2022
		RG_GHNF_BI	-	_		
Sample:	C-1_2022-09-					
oumpie.	09 N	10 N	10 N	16 N	16 N	16 N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC #:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Sieve Size:	400	400	400	400	400	400
SubSample %:	19	100	5	100	50	100
- Judganipie 70.	15	100	3	100	30	100
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: Ephemerellidae	2	0	0	0	0	1
Order: Plecoptera	10	0	1	6	12	1
Family: Capniidae	84	27	25	22	17	18
Mesocapnia	1	2	0	0	0	0
Family: Chloroperlidae	9	0	0	1	1	6
Sweltsa	3	0	0	0	0	2
Family: Nemouridae	7	2	2	1	5	4
Malenka	1	0	0	0	0	0
Zapada	0	0	0	12	8	17
Zapada cinctipes	1	0	0	15	0	6
Family: Perlodidae	63	34	53	21	34	5
Isoperla	0	4	1	0	1	1
Kogotus	0	0	0	0	0	1
Megarcys	0	1	3	5	4	10
Family: Taeniopterygidae	0	0	0	2	23	15
Order: Trichoptera	0	4	0	0	0	0
Family: Hydropsychidae	0	0	0	0	1	0
Family: Limnephilidae	8	44	0	3	0	2
Ecclisomyia	0	0	0	1	0	1
Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	0	1	0	0	0	0
Rhyacophila betteni group	0	0	0	0	1	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	5
Rhyacophila narvae	0	0	0	1	0	5
Rhyacophila vofixa group	0	0	0	2	0	0
Order: Diptera	0	0	0	0	2	0
Family: Chironomidae	6	9	29	20	31	20
Subfamily: Chironominae	0	0	0	0	0	0
Tribe: Tanytarsini	0	0	0	0	0	0
Micropsectra	0	1	1	2	2	0
Subfamily: Diamesinae	0	0	0	0	0	0
Tribe: Diamesini	0	0	0	0	0	0
Pagastia	12	5	37	34	29	28
Pseudodiamesa	16	28	19	7	2	3
Subfamily: Orthocladiinae	0	0	0	0	0	0



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site:		2022	2022	2022	2022	2022
		RG_GHNF_BI				
Sample:	_	C-3_2022-09-				_
	09_N	10_N	10_N	16_N	16_N	16_N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC #:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Sieve Size:	400	400	400	400	400	400
SubSample %:	19	100	5	100	50	100
Brillia	0	0	2	0	0	0
Corynoneura	0	1	0	0	0	0
Eukiefferiella	1	0	1	101	84	78
Hydrobaenus	10	90	29	9	2	16
Limnophyes	0	2	0	0	0	0
Orthocladius complex	0	0	5	9	23	5
Parametriocnemus	0	1	2	0	0	0
Tvetenia	37	4	309	22	45	17
Subfamily: Prodiamesinae	0	0	0	0	0	0
Monodiamesa	0	1	0	0	0	0
Subfamily: Tanypodinae	0	0	0	0	0	0
Ablabesmyia	0	0	0	1	0	0
Zavrelimyia	2	7	0	1	0	2
Family: Dixidae	0	0	0	0	0	0
Dixa	0	0	0	0	0	1
Family: Empididae	3	2	3	1	3	1
Neoplasta	20	21	2	11	16	29
Trichoclinocera	1	0	0	0	0	0
Family: Limoniidae	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	1
Family: Muscidae	0	0	0	0	0	0
Limnophora	0	0	1	0	0	0
Family: Pelecorhynchidae	0	0	0	0	0	0
Glutops	2	4	0	0	0	5
Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	4	27	10	6	1	10
Family: Tipulidae	2	0	0	2	2	0
Dicranota	Z	8	1	Z	Z	2
Order: Collembola	0	2	0	1	1	2
Subphylum: Chelicerata	0	0	0	0	0	0
Class: Arachnida	0	0	0	0	0	0
Order: Trombidiformes	0	0	0	0	0	0
Family: Lebertiidae	0	0	0	0	0	0
Lebertia	0	2	0	0	0	2
Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	0	0	0	1	0
Phylum: Annolida	C	0	0	C	C	0
Phylum: Annelida Subphylum: Clitellata	0	0	0	0	0	0
Class: Oligochaeta	0	0	0	0	0	0
Order: Tubificida	0	0	0	0	0	0
Order: Tubilicida	U	U	U	U	U	U



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

250-494-7553

Site:	2022	2022	2022	2022	2022	2022
		RG_GHNF_BI		_~==		_~==
Sample:		C-3_2022-09-				
	09 N	10 N	10 N	16 N	16 N	16 N
Sample Collection Date:	9-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
CC #:	CC231330	CC231331	CC231332	CC231333	CC231334	CC231335
Sieve Size:	400	400	400	400	400	400
SubSample %:	19	100	5	100	50	100
Family: Enchytraeidae	0	0	0	0	4	0
Enchytraeus	4	0	0	0	0	2
Family: Naididae	0	0	0	0	0	0
Subfamily: Tubificinae with hair chaetae	0	2	0	0	0	0
Subfamily: Tubificinae without hair chaetae	2	7	6	0	0	0
100000000000000000000000000000000000000	_	•		· ·	•	0
						4
Order: Oribatida	0	1	0	0	2	1
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	0	0	0	1	0	0
Class: Gastropoda	0	0	0	1	0	2
Order: Hypsogastropoda	0	0	0	0	0	0
Family: Hydrobiidae	0	0	0	1	0	0
Totals:	311	344	542	322	357	327

#### Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0
Class: Copepoda	0	1	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
Class: Ostracoda	1	1	1	1	1	1
Phylum: Nemata	1	1	0	0	1	1
Phylum: Platyhelminthes	0	0	0	0	0	0
Class: Turbellaria	1	1	1	1	1	1
Totals:	3	4	2	2	3	3



# CORDILLERA CONSULTING FRESHWATER NVERTEBRATE TAXONOMY Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Site - 2022, Sample - RG_GHNF_BIC-	1_2022-09-09_N, CC# - CC231330,	, Percent sa
Perlodidae	Juvenile/Damaged	63
Capniidae	Juvenile/Damaged	84
Chloroperlidae	Juvenile/Damaged	9
Nemouridae	Juvenile/Damaged	7
Empididae	Juvenile/Damaged	3
Ephemerellidae	Juvenile/Damaged	2
Limnephilidae	Juvenile/Damaged	8
Chironomidae	Pupa	6
Zavrelimyia	Larvae	2
Sweltsa	Larvae	3
Mesocapnia	Larvae	1
Zapada cinctipes	Larvae	1
Malenka	Larvae	1
Neoplasta	Larvae	20
Trichoclinocera	Larvae	1
Pericoma/Telmatoscopus	Larvae	4
Dicranota	Larvae	2
Glutops	Larvae	2
Enchytraeus	None	4
Hydrobaenus	Larvae	10
Pseudodiamesa	Larvae	16
Tvetenia	Larvae	37
Pagastia	Larvae	12
Eukiefferiella	Larvae	1
Plecoptera	Juvenile/Damaged	10
Tubificinae without hair chaetae	None	2
Total:		311

Site - 2022, Sample - RG_GHNF_BIC-3	_2022-09-10_N, CC# - CC231331, F	Percent sa
Chironomidae	Pupa	9
Perlodidae	Juvenile/Damaged	34
Capniidae	Juvenile/Damaged	27
Nemouridae	Juvenile/Damaged	2
Limnephilidae	Juvenile/Damaged	44
Empididae	Pupa	2
Pseudodiamesa	Larvae	28
Hydrobaenus	Larvae	90
Pagastia	Larvae	5
Micropsectra	Larvae	1
Tvetenia	Larvae	4
Zavrelimyia	Larvae	7
Limnophyes	Larvae	2
Monodiamesa	Larvae	1
Parametriocnemus	Larvae	1
Corynoneura	Larvae	1
Isoperla	Larvae	4
Megarcys	Larvae	1
Mesocapnia	Larvae	2
Rhyacophila	Larvae	1

Neoplasta	Larvae	21
Pericoma/Telmatoscopus	Larvae	27
Glutops	Larvae	4
Dicranota	Larvae	8
Lebertia	Adult	2
Collembola	None	2
Trichoptera	Juvenile/Damaged	4
Oribatida	Adult	1
Tubificinae with hair chaetae	None	2
Tubificinae without hair chaetae	None	7
Total:		344

Chironomidae	Pupa	29
Perlodidae	Juvenile/Damaged	53
Capniidae	Juvenile/Damaged	25
Nemouridae	Juvenile/Damaged	2
Empididae	Juvenile/Damaged	2
Empididae	Pupa	1
Pseudodiamesa	Larvae	19
Pagastia	Larvae	37
Hydrobaenus	Larvae	29
Orthocladius complex	Larvae	5
Parametriocnemus	Larvae	2
Eukiefferiella	Larvae	1
Brillia	Larvae	2
Micropsectra	Larvae	1
Tvetenia	Larvae	309
soperla	Larvae	1
Megarcys	Larvae	3
Pericoma/Telmatoscopus	Larvae	10
Neoplasta	Larvae	2
Dicranota	Larvae	1
Limnophora	Larvae	1
Plecoptera	Juvenile/Damaged	1
Tubificinae without hair chaetae	None	6
Total:		542

Site - 2022, Sample - RG_GHDT_BIC-1	_2022-09-16_N, CC# - CC231333	, Percent sa
Empididae	Pupa	1
Hydrobiidae	None	1
Limnephilidae	Juvenile/Damaged	3
Pisidiidae	Juvenile/Damaged	1
Chironomidae	Pupa	20
Perlodidae	Juvenile/Damaged	21
Capniidae	Juvenile/Damaged	22
Nemouridae	Juvenile/Damaged	1
Taeniopterygidae	Juvenile/Damaged	2
Chloroperlidae	Juvenile/Damaged	1
Orthocladius complex	Larvae	9
Ablabesmyia	Larvae	1
Dicranota	Larvae	2
Zavrelimyia	Larvae	1
Eukiefferiella	Larvae	101
Rhyacophila narvae	Larvae	1
Ecclisomyia	Larvae	1
Rhyacophila vofixa group	Larvae	2
Megarcys	Larvae	5
Zapada cinctipes	Larvae	15
Zapada	Larvae	12

Micropsectra	Larvae	2
Pseudodiamesa	Larvae	7
Pagastia	Larvae	34
Tvetenia	Larvae	22
Pericoma/Telmatoscopus	Larvae	6
Hydrobaenus	Larvae	9
Neoplasta	Larvae	11
Collembola	None	1
Plecoptera	Juvenile/Damaged	6
Gastropoda	Juvenile/Damaged	1
Total:		322

Site - 2022, Sample - RG_GHDT_BIC-3	3_2022-09-16_N, CC# - CC231334, P	ercent sa
Chironomidae	Pupa	31
Enchytraeidae	None	4
Perlodidae	Juvenile/Damaged	34
Capniidae	Juvenile/Damaged	17
Chloroperlidae	Juvenile/Damaged	1
Taeniopterygidae	Juvenile/Damaged	23
Nemouridae	Juvenile/Damaged	5
Empididae	Pupa	3
Hydropsychidae	Juvenile/Damaged	1
Pagastia	Larvae	29
Tvetenia	Larvae	45
Orthocladius complex	Larvae	23
Hydrobaenus	Larvae	2
Pseudodiamesa	Larvae	2
Micropsectra	Larvae	2
Eukiefferiella	Larvae	84
Megarcys	Larvae	4
Isoperla	Larvae	1
Zapada	Larvae	8
Neoplasta	Larvae	16
Dicranota	Larvae	2
Pericoma/Telmatoscopus	Larvae	1
Rhyacophila betteni group	Larvae	1
Sperchon	Adult	1
Collembola	None	1
Plecoptera	Juvenile/Damaged	12
Diptera	Juvenile/Damaged	2
Oribatida	Adult	2
Total:		357

Site - 2022, Sample - RG_GHDT_	BIC-5_2022-09-16_N, CC# - CC231335,	Percent sa
Chironomidae	Pupa	20
Perlodidae	Juvenile/Damaged	5
Capniidae	Juvenile/Damaged	18
Chloroperlidae	Juvenile/Damaged	6
Nemouridae	Juvenile/Damaged	4
Taeniopterygidae	Juvenile/Damaged	15
Empididae	Pupa	1
Ephemerellidae	Juvenile/Damaged	1
Limnephilidae	Juvenile/Damaged	2
Enchytraeus	None	2
Hydrobaenus	Larvae	16
Tvetenia	Larvae	17
Pagastia	Larvae	28
Orthocladius complex	Larvae	5
Pseudodiamesa	Larvae	3
Zavrelimyia	Larvae	2

Eukiefferiella	Larvae	78
Kogotus	Larvae	1
Isoperla	Larvae	1
Megarcys	Larvae	10
Sweltsa	Larvae	2
Zapada cinctipes	Larvae	6
Zapada	Larvae	17
Neoplasta	Larvae	29
Glutops	Larvae	5
Pericoma/Telmatoscopus	Larvae	10
Dixa	Larvae	1
Dicranota	Larvae	2
Eloeophila	Larvae	1
Rhyacophila narvae	Larvae	5
Rhyacophila brunnea/vemna group	Larvae	5
Ecclisomyia	Larvae	1
Lebertia	Adult	2
Collembola	None	2
Plecoptera	Juvenile/Damaged	1
Oribatida	Adult	1
Gastropoda	Juvenile/Damaged	2
Total:		327



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

Client	Project	Site	Sample	Date	CC#	400 micron f	raction
						% Sampled #	Invertebrates
Minnow Environmental (BC)	22-16 (GC	l	2022 RG_GHNF_	9-Sep-22	CC231330	19%	311
Minnow Environmental (BC)	22-16 (GC	l	2022 RG_GHNF_	10-Sep-22	CC231331	100%	344
Minnow Environmental (BC)	22-16 (GC	l	2022 RG_GHNF_	10-Sep-22	CC231332	5%	542
Minnow Environmental (BC)	22-16 (GC	l	2022 RG_GHDT_	16-Sep-22	CC231333	100%	322
Minnow Environmental (BC)	22-16 (GC	l	2022 RG_GHDT_	16-Sep-22	CC231334	50%	357
Minnow Environmental (BC)	22-16 (GC	l	2022 RG GHDT	16-Sep-22	CC231335	100%	327



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

	Functional Feeding Groups	Abbreviation	ITIS Number	Tolerance Voltinism	Habit
Phylum: Arthropoda	Unclassified		82696		
Subphylum: Hexapoda	Unclassified		563886		
Class: Insecta	Unclassified		118831		
Order: Ephemeroptera					
Family: Ephemerellidae	Collector-Gatherer	CG	101232	1 Unclassified	
Order: Plecoptera					
Family: Capniidae	Shredder-Herbivore	SH	102643	1 Unclassified	
Mesocapnia	Shredder-Herbivore	SH	102771	1 UV	0
Family: Chloroperlidae	Predator	Р	103202	1 Unclassified	
Sweltsa	Predator	P	103273	1 SV	
Family: Nemouridae	Shredder-Herbivore	SH	102517	2 Unclassified	
Malenka	Shredder-Herbivore	SH	102567	2 Unclassified	
Zapada	Shredder-Herbivore	SH	102591	2 Unclassified	
Zapada cinctipes	Shredder-Herbivore	SH	102594	2 UV	
Family: Perlodidae	Predator	Р	102994	2 Unclassified	
Isoperla	Predator	Р	102995	2 UV	
Kogotus	Predator	Р	103149	2 Unclassified	
Megarcys	Predator	P	103110	2 Unclassified	
Family: Taeniopterygidae	Shredder-Herbivore	SH	102788	2 Unclassified	
Order: Trichoptera					
Family: Hydropsychidae	Collector-Filterer	CF	115398	4 Unclassified	
Family: Limnephilidae	Collector-Gatherer	CG	115933	4 Unclassified	
Ecclisomyia	Omnivore	OM	116025	2 Unclassified	
Family: Rhyacophilidae	Predator	P	115096	0 Unclassified	
Rhyacophila	Predator	P	115097	0 Unclassified	
Rhyacophila betteni group	Predator	P	115097C	1 Unclassified	
Rhyacophila brunnea/vemna group	Predator	P P	115097D 115155	1 0	
Rhyacophila narvae Rhyacophila vofixa group	Predator Predator	P	115155	0 Unclassified	
кпуисорпни чојки дгоир	riedatoi	r	1130973	o officiassified	
Order: Diptera					
Family: Chironomidae	Unclassified	66	127917	6	
Subfamily: Chironominae	Collector-Gatherer	CG	129228	6	
Tribe: Tanytarsini	Collector-Gatherer Collector-Gatherer	CG CG	129872 129890	6 7	
Micropsectra   Subfamily: Diamesinae	Collector-Gatherer	CG	128341	2	
Tribe: Diamesini	Collector-Gatherer	CG	128351	4	
Pagastia	Collector-Gatherer	CG	128331	1	
Pseudodiamesa	Collector-Gatherer	CG	128416	6	
Subfamily: Orthocladiinae	Collector-Gatherer	CG	128457	5	
Brillia	Shredder-Herbivore	SH	128477	5	
Corynoneura	Collector-Gatherer	CG	128563	7	
Eukiefferiella	Omnivore	OM	128689	8	
Hydrobaenus	Collector-Gatherer	CG	128750	8	
Limnophyes	Collector-Gatherer	CG	128776	8	
Orthocladius complex	Collector-Gatherer	CG	128874A	6	
				-	



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

	Functional Feeding Groups	Abbreviation	ITIS Number	Tolerance	Voltinism	Habit
Parametriocnemus	Collector-Gatherer	CG	128978	5		
Tvetenia	Collector-Gatherer	CG	129197	5		
Subfamily: Prodiamesinae	Collector-Gatherer	CG	128437	6		
Monodiamesa	Collector-Gatherer	CG	128440	7		
Subfamily: Tanypodinae	Predator	P	127994	7		
Ablabesmyia	Collector-Gatherer	CG	128079	8		
Zavrelimyia	Predator	Р	128259	8		
Family: Dixidae	Unclassified		125809	2		
Dixa	Collector-Gatherer	CG	125810	2		
Family: Empididae	Predator	Р	135830	6 ل	JV	
Neoplasta	Predator	Р	136352	6		
Trichoclinocera	Predator	Р	135903	6		
Family: Limoniidae	Unclassified		118833A			0
Eloeophila	Predator	Р	118833B	4		
Family: Muscidae	Predator	Р	150025	6		
Limnophora	Predator	Р	150730	6		
Family: Pelecorhynchidae	Predator	P	130914	3		
Glutops	Predator	P	130915	3		
Family: Psychodidae	Collector-Gatherer	CG	125351	10		
Pericoma/Telmatoscopus	Collector-Gatherer	CG	125351A	4		
Family: Tipulidae	Shredder-Herbivore	SH	118840	3		
Dicranota	Predator	Р	121027	3 L	JV	
Order: Collembola						
Subphylum: Chelicerata	Unclassified		82697			
Class: Arachnida	Predator	Р	733326	5		
Order: Trombidiformes						
Family: Lebertiidae	Predator	Р	83033	5 L	Jnclassified <b>J</b>	
Lebertia	Predator	Р	83034	8 ل	Jnclassified <b>Section</b>	
Family: Sperchontidae	Unclassified		895710	5 L	Jnclassified <b>Section</b>	
Sperchon	Predator	Р	83006	8 ل	Inclassified	
Phylum: Annelida	Unclassified		64357			
Subphylum: Clitellata	Unclassified		568832			
Class: Oligochaeta	Unclassified		68498			
Order: Tubificida	Officiassifica		00450			
Family: Enchytraeidae	Collector-Gatherer	CG	68510	10		
Enchytraeus	Collector-Gatherer	CG	68531	10		
Family: Naididae	Collector-Gatherer	CG	68854	10		
Subfamily: Tubificinae with hair chaetae	Collector-Gatherer	CG	974289	10		
Subfamily: Tubificinae without hair chaetae		CG	974289	10		
Order: Oribatida						
Phylum: Mollusca	Unclassified		69458			
l Class: Bivalvia	Unclassified		80384			
Order: Veneroida			00004			
1 C. Collection						



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

scottfinlayson@cordilleraconsulting.ca

	Functional Feeding Groups	Abbreviation	ITIS Number	Tolerance	Voltinism	Habit
Family: Pisidiidae	Collector-Filterer	CF	81388	8		
Class: Gastropoda	Unclassified		566851			
Order: Hypsogastropoda   Family: Hydrobiidae	Scraper	SC	70493	7		
Taxa present but not included:						
Phylum: Arthropoda   Class: Copepoda	Unclassified Collector-Gatherer	CG	82696 85257	8		0
Subphylum: Crustacea   Class: Ostracoda	Collector-Gatherer Collector-Gatherer	CG CG	83677 84195	8		0
Phylum: Nemata	Shredder-Herbivore	SH	563956			
Phylum: Platyhelminthes   Class: Turbellaria	Unclassified Predator	P	53963 53964	7 4		



Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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Phylum	Sub Phylum	Class	Order	Family	Subfamily	Tribe
Arthropoda	Hexapoda	Insecta	Ephemeroptera	Ephemerellidae		
Arthropoda	Hexapoda	Insecta	Plecoptera			
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Capniidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Chloroperlidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Nemouridae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Perlodidae		
Arthropoda	Hexapoda	Insecta	Plecoptera	Taeniopterygidae		
Arthropoda	Hexapoda	Insecta	Trichoptera			
Arthropoda	Hexapoda	Insecta	Trichoptera	Hydropsychidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Limnephilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Limnephilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae		
Arthropoda	Hexapoda	Insecta	Trichoptera	Rhyacophilidae		
Arthropoda	Hexapoda	Insecta	Diptera			
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae		
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Chironominae	Tanytarsini
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Diamesinae	Diamesini
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Orthocladiinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Prodiamesinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Tanypodinae	
Arthropoda	Hexapoda	Insecta	Diptera	Chironomidae	Tanypodinae	
Arthropoda	Hexapoda	Insecta	Diptera	Dixidae		
Arthropoda	Hexapoda	Insecta	Diptera	Empididae		
Arthropoda	Hexapoda	Insecta	Diptera	Empididae		
Arthropoda	Hexapoda	Insecta	Diptera	Empididae		
Arthropoda	Hexapoda	Insecta	Diptera	Limoniidae		
Arthropoda	Hexapoda	Insecta	Diptera	Muscidae		
Arthropoda	Hexapoda	Insecta	Diptera	Pelecorhynchidae		
Arthropoda	Hexapoda	Insecta	Diptera	Psychodidae		
Arthropoda	Hexapoda	Insecta	Diptera	Tipulidae		
Arthropoda			Collembola			
Arthropoda		Copepoda				
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Lebertiidae		
Arthropoda	Chelicerata	Arachnida	Trombidiformes	Sperchontidae		
•				•		



#### CORDILLERA CONSULTING

FRESHWATER INVERTEBRATE TAXONOMY

Project: 22-16 (GC LAEMP) (Formerly GGCAMP)

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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250-494-7553

Arthropoda Crustacea Ostracoda
Annelida Clitellata Oligochaeta Tubificida

Annelida Clitellata Oligochaeta Tubificida Enchytraeidae Annelida Clitellata Oligochaeta Tubificida Naididae Tubificinae with hair chaetae Annelida Clitellata Oligochaeta Tubificida Naididae Tubificinae without hair chaetae

Chelicerata Arachnida Oribatida

Mollusca Bivalvia Veneroida Pisidiidae

Mollusca Gastropoda

Mollusca Gastropoda Hypsogastropoda Hydrobiidae

Nemata

Platyhelminthes Turbellaria

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

Enchytraeidae



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		Functional Feeding		
Phylum	Voltinism	Group	Maturity	Name
Arthropoda	Unclassified	Collector-Gatherer	Juvenile/Damaged	Ephemerellidae
Arthropoda	Unclassified		Juvenile/Damaged	Plecoptera
Arthropoda	Unclassified	Shredder-Herbivore	Juvenile/Damaged	Capniidae
Arthropoda	UV	Shredder-Herbivore	Larvae	Mesocapnia
Arthropoda	Unclassified	Predator	Juvenile/Damaged	Chloroperlidae
Arthropoda	SV	Predator	Larvae	Sweltsa
Arthropoda	Unclassified	Shredder-Herbivore	Juvenile/Damaged	Nemouridae
Arthropoda	Unclassified	Shredder-Herbivore	Larvae	Malenka
Arthropoda	Unclassified	Shredder-Herbivore	Larvae	Zapada
Arthropoda	UV	Shredder-Herbivore	Larvae	Zapada cinctipes
Arthropoda	Unclassified	Predator	Juvenile/Damaged	Perlodidae
Arthropoda	UV	Predator	Larvae	Isoperla
Arthropoda	Unclassified	Predator	Larvae	Kogotus
Arthropoda	Unclassified	Predator	Larvae	Megarcys
Arthropoda	Unclassified	Shredder-Herbivore	Juvenile/Damaged	Taeniopterygidae
Arthropoda			Juvenile/Damaged	Trichoptera
Arthropoda	Unclassified	Collector-Filterer	Juvenile/Damaged	Hydropsychidae
Arthropoda	Unclassified	Collector-Gatherer	Juvenile/Damaged	Limnephilidae
Arthropoda	Unclassified	Omnivore	Larvae	Ecclisomyia
Arthropoda	Unclassified	Predator	Larvae	Rhyacophila
Arthropoda	Unclassified	Predator	Larvae	Rhyacophila betteni group
Arthropoda		Predator	Larvae	Rhyacophila brunnea/vemna group
Arthropoda		Predator	Larvae	Rhyacophila narvae
Arthropoda	Unclassified	Predator	Larvae	Rhyacophila vofixa group
Arthropoda			Juvenile/Damaged	Diptera
Arthropoda			Pupa	Chironomidae
Arthropoda		Collector-Gatherer	Larvae	Micropsectra
Arthropoda		Collector-Gatherer	Larvae	Pagastia
Arthropoda		Collector-Gatherer	Larvae	Pseudodiamesa
Arthropoda		Shredder-Herbivore	Larvae	Brillia
Arthropoda		Collector-Gatherer	Larvae	Corynoneura
Arthropoda		Omnivore	Larvae	Eukiefferiella
Arthropoda		Collector-Gatherer	Larvae	Hydrobaenus
Arthropoda		Collector-Gatherer	Larvae	Limnophyes
Arthropoda		Collector-Gatherer	Larvae	Orthocladius complex
Arthropoda		Collector-Gatherer	Larvae	Parametriocnemus
Arthropoda		Collector-Gatherer	Larvae	Tvetenia
Arthropoda		Collector-Gatherer	Larvae	Monodiamesa
Arthropoda		Collector-Gatherer	Larvae	Ablabesmyia
Arthropoda		Predator	Larvae	, Zavrelimyia
Arthropoda		Collector-Gatherer	Larvae	Dixa
Arthropoda	UV	Predator	Pupa	Empididae
Arthropoda		Predator	Larvae	Neoplasta
Arthropoda		Predator	Larvae	Trichoclinocera
Arthropoda		Predator	Larvae	Eloeophila
Arthropoda		Predator	Larvae	Limnophora
Arthropoda		Predator	Larvae	Glutops
Arthropoda		Collector-Gatherer	Larvae	Pericoma/Telmatoscopus
Arthropoda	UV	Predator	Larvae	Dicranota
Arthropoda	•	Collector-Gatherer	None	Collembola
Arthropoda		Collector-Gatherer	None	Copepoda
Arthropoda	Unclassified	Predator	Adult	Lebertia
Arthropoda	Unclassified	Predator	Adult	Sperchon
	3			



Minnow Environmental (BC)
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Arthropoda Collector-Gatherer None Ostracoda
Annelida Collector-Gatherer None Enchytraeidae
Annelida Collector-Gatherer None Enchytraeus

Annelida Collector-Gatherer None Tubificinae with hair chaetae
Annelida Collector-Gatherer None Tubificinae without hair chaetae

Predator Adult Oribatida Mollusca Juvenile/Damaged Pisidiidae Collector-Filterer Mollusca Scraper Juvenile/Damaged Gastropoda Mollusca Scraper None Hydrobiidae Nemata Shredder-Herbivore None Nemata Platyhelminthes Predator None Turbellaria

ND designation of a taxa represy represented by Genus or Species level identifications.



CORDILLERA CONSULTINI
FRESHWATER INVERTEBRATE TAXONOM
Project: 22-16 (GC LAEMP) (For
Minnow Environmental (BC)

Taxonomist: Scott Finlayson scottfinlayson@cordilleraconsu

Phylum	ND	Site Sample	Date	CC#	Count Pe	rcent Sai
Arthropoda	ND	2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	1	100
Arthropoda	ND	2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	27	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	6	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	2	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231333	2	100
Arthropoda		2022 RG_GHNF_BIC-1_2022-09-09_N	9-Sep-22	CC231331 CC231330	1	19
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	17	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	6	100
Arthropoda	ND	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231333	34	100
Arthropoda	ND		10-Sep-22	CC231331	4	100
•		2022 RG_GHNF_BIC-3_2022-09-10_N	-	CC231331 CC231335		100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22		1	
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda	ND	2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	15	100
Arthropoda	ND	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	4	100
Arthropoda		2022 RG_GHDT_BIC-3_2022-09-16_N	16-Sep-22	CC231334	1	50
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	44	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		2022 RG_GHDT_BIC-3_2022-09-16_N	16-Sep-22	CC231334	1	50
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	5	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	5	100
Arthropoda		2022 RG_GHDT_BIC-1_2022-09-16_N	16-Sep-22	CC231333	2	100
Arthropoda		2022 RG_GHDT_BIC-3_2022-09-16_N	16-Sep-22	CC231334	2	50
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	9	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	5	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	28	100
Arthropoda		2022 RG_GHNF_BIC-5_2022-09-10_N	10-Sep-22	CC231332	2	5
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	78	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	90	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	5	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	4	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		2022 RG_GHDT_BIC-1_2022-09-16_N	16-Sep-22	CC231333	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	7	100
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	1	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	21	100
Arthropoda		2022 RG_GHNF_BIC-1_2022-09-09_N	9-Sep-22	CC231330	1	19
Arthropoda		2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	1	100
Arthropoda		2022 RG_GHNF_BIC-5_2022-09-10_N	10-Sep-22	CC231332	1	5
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	4	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	27	100
Arthropoda		 2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	8	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Arthropoda		2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Arthropoda		 2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Arthropoda		 2022 RG_GHDT_BIC-3_2022-09-16_N	16-Sep-22	CC231334	1	50
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CORDILLERA CONSULTING FRESHWATER INVERTEBRATE TAXONON Project: 22-16 (GC LAEMP) (For Minnow Environmental (BC)

Taxonomist: Scott Finlayson scottfinlayson@cordilleraconsu 250-494-7553

250-494-7553					
Arthropoda	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Annelida	2022 RG_GHDT_BIC-3_2022-09-16_N	16-Sep-22	CC231334	4	50
Annelida	2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	2	100
Annelida	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	2	100
Annelida	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	7	100
	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Mollusca	2022 RG_GHDT_BIC-1_2022-09-16_N	16-Sep-22	CC231333	1	100
Mollusca	2022 RG_GHDT_BIC-5_2022-09-16_N	16-Sep-22	CC231335	2	100
Mollusca	2022 RG_GHDT_BIC-1_2022-09-16_N	16-Sep-22	CC231333	1	100
Nemata	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100
Platyhelminthes	2022 RG_GHNF_BIC-3_2022-09-10_N	10-Sep-22	CC231331	1	100

ND designation of a taxa repres



## CORDILLERA CONSULTING FRESHWATER INVERTEBRATE TAXONOM Project: 22-16 (GC LAEMP) (For

Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsu

81.1	6 : 6:
Phylum	Seive Size
Arthropoda	400
Arthropoda	400
Arthropoda	400
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Arthropoda	400



#### CORDILLERA CONSULTINI FRESHWATER INVERTEBRATE TAXONOM Project: 22-16 (GC LAEMP) (For

Minnow Environmental (BC) Taxonomist: Scott Finlayson scottfinlayson@cordilleraconsu

250-494-7553	
Arthropoda	400
Annelida	400
Annelida	400
Annelida	400
Annelida	400
	400
Mollusca	400
Mollusca	400
Mollusca	400
Nemata	400
Platyhelminthes	400

ND designation of a taxa repres



#### CORDILLERA CONSULTING

FRESHWATER INVERTEBRATE TAXONOMY

**Project: 22-16 (GC LAEMP) (Formerly GGCAMP)** 

Minnow Environmental (BC) Taxonomist: Scott Finlayson

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250-494-7553

Total from Percent Efficiency

Site - QC, Sample - QC 1, CC# - CC231333, Percen	t sampled = 100%, Sieve si	ze = 400	
Chironomidae	4		
Plecoptera	2		
Empididae	1		
Ephemerellidae	1		
Diptera	1		
Total:	9	322	97.20%

# ZEAS - BENTHIC INVERTEBRATE COMMUNITY

TABLE 1: CALCULATION OF SUBSAMPLING ERROR FOR BENTHIC MACROINVERTEBRATE SAMPLES FROM LOWER GREENHILLS (2022).

	Whole	Number of	Number of	Number of	Number of	Actual				
Station	Organisms	Organisms	Organisms	Organisms	Organisms	Density*	Prec	ision	Accı	ıracy
		in Fraction 1	in Fraction 2	in Fraction 3	in Fraction 4		% r	ange	min	max
GHBP-6	-	196	200	-	-	396	2.0	-	1.0	-
GHFF-1	-	144	164	-	-	308	12.2	-	6.5	-
GHUT-6		141	179	-	-	-	21.2	-	-	-

^{*} whole large organisms excluded in calculations.

min = minimum absolute % error

max = maximum absolute % error

TABLE 2: PERCENT RECOVERY OF BENTHIC MACROINVERTEBRATES FROM SAMPLES COLLECTED FROM LOWER GRENNHILLS (2022).

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
GANF-6	183	190	96.3%
GHBP-6	378	396	95.5%
GHDT-1	81	84	96.4%
GHDT-5	135	145	93.1%
GHNF-5	215	230	93.5%
		Average % Recovery	95.0%

TABLE 3: SAMPLE FRACTIONS SORTED FROM LOWER GREENHILLS (2022).

Station	Fraction	Station	Fraction	Station	Fraction
	Sorted		Sorted		Sorted
GANF-1	1/2	GHBP-3	1/4	GHDT-5	1/2
GANF-2	1/2	GHBP-4	1/4	GHDT-6	Whole
GANF-3	1/2	GHBP-5	1/2	GHFF-1	Whole ^a
GANF-4	1/2	GHBP-6	Whole ^a	GHFF-2	Whole
GANF-5	1/2	GHNF-1	1/8	GHFF-3	Whole
GANF-6	Whole	GHNF-2	1/4	GHFF-4	Whole
GAUT-1	1/2	GHNF-3	Whole	GHFF-5	Whole
GAUT-2	1/2	GHNF-4	1/16	GHFF-6	1/4
GAUT-3	1/2	GHNF-5	1/16	GHUT-1	1/4, 1/16 ^c
GAUT-4	1/2	GHNF-6	1/16	GHUT-2	1/4
GAUT-5	Whole	GHDT-1	1/4	GHUT-3	Whole
GAUT-6	1/2	GHDT-2	1/2	GHUT-4	1/2
GHBP-1	1/2	GHDT-3	Whole	GHUT-5	1/4
GHBP-2	1/2	GHDT-4	Whole	GHUT-6	1/8 ^b

^a two halves sorted for subsampling error calculations.

#### QA/QC Notes

Pupae should not be counted toward total number of taxa unless they were the sole representative of their taxa group. Immatures should not be counted toward total number of taxa unless they were the sole representative of their taxa group. The exceptions to this rule are immature tubificidae with and without hairs. Immature oligocheates are counted as taxa as the probability of the immature being a unique taxa is high.

Indeterminates are unique taxa that could not be identified further for whatever reason, e.g., (small, damaged).

Reported fractions averaged 4 hours to sort due to high quantities of organic matter. ZEAS has shown that subsampling precision and accuracy are density dependent (Zaranko and Keene 2005). Specifically, small absolute differences between subsampled fractions become increasingly large, when expressed as a percentage of total organisms, as organism densities decline. Therefore, the probability of meeting precision and accuracy criteria is reduced in samples with low organism densities (i.e., <150 organisms/subsample).

Zaranko, D.T. and J. Keene. 2005. Are the costs to meet environmental effects monitoring (EEM) benthic sample precision and accuracy criteria justified? In Dixon, D.G., S. Munro and A.J. Niimi (eds). Proceedings of the 32nd Annual Aquatic Toxicity Workshop: October 3 to 5, 2005, Waterloo, Ontario. Can. Tech. Rep. Fish. Aquat. Sci: 2617. 120p.

^b two sixteenths sorted for subsampling error calculations.

^c algae portion of sample sorted to 1/16, remaining sample sorted to 1/4

TABLE 1: CALCULATION OF SUBSAMPLING ERROR FOR BENTHIC MACROINVERTEBRATE SAMPLES FROM GREEN HILLS POND (2022).

Station	Whole Organisms	Number of Organisms		- 1000000		Actual Density*	Prec	ision	Accu	ıracy
	Ü	in Fraction 1	in Fraction 2	in Fraction 3	in Fraction 4		% r	ange	min	max
GHP-06	-	262	276	289	337	1164	4.5	22.3	0.7	15.8
GHP-06	-	538	626			1164	14.1	-	7.6	-

^{*} whole large organisms excluded in calculations.

min = minimum absolute % error

max = maximum absolute % error

TABLE 2: PERCENT RECOVERY OF BENTHIC MACROINVERTEBRATES FROM SAMPLES COLLECTED FROM GREEN HILLS POND (2022).

Station	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
GHP-06	1158	1164	99.5%

TABLE 3: SAMPLE FRACTIONS SORTED FROM GREEN HILLS POND (2022).

Station	Fraction Sorted	Station	Fraction Sorted
GHP-01	1/4	GHP-04	1/4
GHP-02	1/8	GHP-05	Whole
GHP-03	1/2	GHP-06	Whole ^{ab}

^a four quarters sorted for subsampling error calculations.

#### QA/QC Notes

Indeterminates are unique taxa that could not be identified further for whatever reason, e.g., (small, damaged).

^b two halves sorted for subsampling error calculations.

survey date quantit	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Planariidae	50	400	0.001	2
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Polycelis	50	400	L	
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	0.000	5
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Sperchonidae	50	400	0.001	3
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Sperchon	50	400	L	
9/13/2022	25 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	50	400	0.006	6
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Elmidae	50	400	0.000	1
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Elmidae	50	400	L	immature
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Baetidae	50	400	0.003	7
9/13/2022	2 RG_GANF_BICA-1-2022-09-13_N			Baetis	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	0.039	4
9/13/2022	53 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Zapada	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Peltoperlidae	50	400	0.001	1
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Yoraperla	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	50	400	0.026	6
9/13/2022	14 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	100	400	0.049	5
9/13/2022	2 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Megarcys	100	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	0.000	8
9/13/2022	2 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	L	immature
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Brachycentridae	50	400	0.001	3
9/13/2022	5 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Micrasema	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Hydropsychidae	50	400	0.001	4
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Hydropsychidae	50	400	L	immature
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	100	400	0.008	0
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	100	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	0.032	6
9/13/2022	15 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Ceratopogonidae	50	400	0.001	1
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Atrichopogon	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	0.060	6
9/13/2022	14 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	L	pupae
9/13/2022	4 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Micropsectra	50	400	L	
9/13/2022	37 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	50	400	L	
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Chaetocladius	50	400	L	
9/13/2022	9 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	L	
9/13/2022	59 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	L	
9/13/2022	5 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Tvetenia	50	400	L	
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Empididae	50	400	0.005	7
9/13/2022	8 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	L	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	0.013	2
9/13/2022	7 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Glutops	50	400	l	
9/13/2022	RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	50	400	0.001	0
9/13/2022	1 RG_GANF_BICA-1-2022-09-13_N	RG_GANF_BICA-1-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	50	400	l	
9/13/2022		RG_GANF_BICA-2-2022-09-13_N		Planariidae	50	400		6
9/13/2022	2 RG_GANF_BICA-2-2022-09-13_N			Polycelis	50	400	l	
9/13/2022	3 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	0.000	4

survey date	quantity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/13/2022	14 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	0.0032	
9/13/2022	1 RG_GANF_BICA-2-2022-09-13_N			Collembola	50	400	1	0.0001	
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	0.0004	
9/13/2022	2 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1		immature
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	0.0036	
9/13/2022	12 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Zapada	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.0851	
9/13/2022	16 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/13/2022	3 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Megarcys	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.0209	
9/13/2022	7 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.0093	
9/13/2022	14 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1		pupae
9/13/2022	15 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	50	400	1		
9/13/2022	7 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1		
9/13/2022	2 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1		
9/13/2022	1 RG GANF BICA-2-2022-09-13 N	RG GANF BICA-2-2022-09-13 N	1/3 m ² kick & sweep	Orthocladiinae	50	400	1		indeterminate
9/13/2022	1 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Empididae	50	400	1	0.0223	
9/13/2022	29 RG GANF BICA-2-2022-09-13 N	RG GANF BICA-2-2022-09-13 N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	1	0.0002	
9/13/2022	1 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Glutops	50	400	1		
9/13/2022	RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	50	400	1	0.0005	
9/13/2022	2 RG_GANF_BICA-2-2022-09-13_N	RG_GANF_BICA-2-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	50	400	1		
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	1	0.0001	
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1	0.1199	
9/13/2022	1 RG GANF BICA-3-2022-09-13 N	RG GANF BICA-3-2022-09-13 N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Naididae	50	400	1	0.0004	
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Tubificinae	50	400	1		immature with hai
9/13/2022	36 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	0.0074	
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	50	400	1	0.0004	
9/13/2022	3 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	50	400	1		immature
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	0.0052	
9/13/2022	5 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Zapada	50	400	1		
9/13/2022	25 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	1		immature
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.0215	
9/13/2022	24 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	100	400	1	0.0332	
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Megarcys	100	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	100	400	1	0.0252	
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1		
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N			Rhyacophilidae	100	400	1		pupae
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.0280	
9/13/2022	2 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.0067	
9/13/2022	3 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1		pupae
9/13/2022	3 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Micropsectra	50	400	1		
9/13/2022	13 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	50	400	1		

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	IESH I	POOLED_REPS	MEASURED_BIOM	ASS QC_COMMENTS
9/13/2022	3 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1		
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1		
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Hydrobaenus	50	400	1		
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Tvetenia	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Empididae	50	400	1	. 0.	0187
9/13/2022	24 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	1	. 0.	0037
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Glutops	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	50	400	1	. 0.	0007
9/13/2022	5 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	50	400	1		
9/13/2022	RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Pediciidae	50	400	1	. 0.	0002
9/13/2022	1 RG_GANF_BICA-3-2022-09-13_N	RG_GANF_BICA-3-2022-09-13_N	1/3 m ² kick & sweep	Dicranota	50	400	1		
9/13/2022	1 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Nematoda	50	400	1	. 0.	0001
9/13/2022	4 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	1	. 0.	0006
9/13/2022	1 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1	. 0.	0075
9/13/2022	8 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	. 0.	0017
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	50	400	1	. 0.	0003
9/13/2022	2 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Paracapnia	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	. 0.	0046
9/13/2022	13 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Zapada	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	. 0.	0133
9/13/2022	14 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	1	. 0.	0004
9/13/2022	5 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	1		immature
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	. 0.	0062
9/13/2022	2 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	. 0.	0053
9/13/2022	5 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1		pupae
9/13/2022	13 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	50	400	1		
9/13/2022	2 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1		
9/13/2022	1 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1		
9/13/2022	1 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Empididae	50	400	1	. 0.	0036
9/13/2022	6 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	50	400	1	. 0.	0006
9/13/2022	4 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Pediciidae	50	400	1	. 0.	0002
9/13/2022	2 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Dicranota	50	400	1		
9/13/2022	RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Tipulidae	50	400	1	. 0.	0009
9/13/2022	1 RG_GANF_BICA-4-2022-09-13_N	RG_GANF_BICA-4-2022-09-13_N	1/3 m ² kick & sweep	Tipula	50	400	1		
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Planariidae	50	400	1	. 0.	0007
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Polycelis	50	400	1		
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	1	. 0.	0008
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Sperchonidae	50	400	1	. 0.	0003
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Sperchon	50	400	1		
9/13/2022	19 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	. 0.	0038
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	50	400	1	. 0.	0007
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Paracapnia	50	400	1		

survey date quantit		LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	50	400	1	immature
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1 0.0021	
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Sweltsa	50	400	1	
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	immature
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	50	400	1 0.0033	}
9/13/2022	17 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Zapada	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	50	400	1 0.0205	;
9/13/2022	21 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	1 0.0005	;
9/13/2022	3 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	1	immature
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1 0.0157	,
9/13/2022	3 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1 0.0058	}
9/13/2022	5 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	pupae
9/13/2022	7 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	50	400	1	
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1	
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1	
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Hydrobaenus	50	400	1	
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Tvetenia	50	400	1	
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Dixidae	50	400	1 0.0009	)
9/13/2022	1 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Dixa	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Empididae	50	400	1 0.0026	;
9/13/2022	6 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	1 0.0061	
9/13/2022	4 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Glutops	50	400	1	
9/13/2022	RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	50	400	1 0.0004	}
9/13/2022	2 RG_GANF_BICA-5-2022-09-13_N	RG_GANF_BICA-5-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	50	400	1	
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Lebertiidae	100	400	1 0.0012	!
9/13/2022	2 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Lebertia	100	400	1	
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Sperchonidae	100	400	1 0.0004	}
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Sperchon	100	400	1	
9/13/2022	94 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Ostracoda	100	400	1 0.0206	;
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Elmidae	100	400	1 0.0005	;
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Heterlimnius	100	400	1	
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	100	400	1 0.0005	;
9/13/2022	2 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Paracapnia	100	400	1	
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Capniidae	100	400	1	immature
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	100	400	1 0.0003	}
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Chloroperlidae	100	400	1	immature
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Nemouridae	100	400	1 0.0030	)
9/13/2022	16 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Zapada	100	400	1	
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Perlodidae	100	400	1 0.0071	
9/13/2022	7 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Isoperla	100	400	1	
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1 0.0001	
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	immature
9/13/2022		RG_GANF_BICA-6-2022-09-13_N		Rhyacophilidae	100	400	1 0.0044	}
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1	

survey date quar	ntity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED ME	SH POO	LED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Chironomidae	100	400	1	0.0096	;
9/13/2022	6 RG_GANF_BICA-6-2022-09-13_N			Chironomidae	100	400	1		pupae
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Micropsectra	100	400	1		
9/13/2022	12 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Pagastia	100	400	1		
9/13/2022	6 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	400	1		
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Heleniella	100	400	1		
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Macropelopia	100	400	1		
9/13/2022	2 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Zavrelimyia	100	400	1		
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Empididae	100	400	1	0.0122	!
9/13/2022	13 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Chelifera/Metachela	100	400	1		
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1	0.0080	)
9/13/2022	6 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Glutops	100	400	1		
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Psychodidae	100	400	1	0.0025	;
9/13/2022	13 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Pericoma	100	400	1		
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Pediciidae	100	400	1	0.0022	!
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Dicranota	100	400	1		
9/13/2022	RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Limoniidae	100	400	1	0.0010	)
9/13/2022	1 RG_GANF_BICA-6-2022-09-13_N	RG_GANF_BICA-6-2022-09-13_N	1/3 m ² kick & sweep	Rhabdomastix	100	400	1		
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1	0.0955	;
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1		
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1	0.0070	)
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1		
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Hygrobatidae	50	400	1	0.0001	
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Hygrobates	50	400	1		
9/14/2022	24 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	0.0030	)
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	1	0.0073	}
9/14/2022	5 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Heterlimnius	50	400	1		
9/14/2022	2 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Heptageniidae	50	400	1	0.0074	}
9/14/2022	6 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Heptageniidae	50	400	1		indeterminate
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Crambidae	50	400	1	0.0016	j
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Capniidae	50	400	1	0.0001	
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Paracapnia	50	400	1		
9/14/2022	3 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Capniidae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	0.0026	;
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Malenka	50	400	1		
9/14/2022	2 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Zapada	50	400	1		
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.0007	•
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Perlodidae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Glossosomatidae	50	400	1	0.0001	
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Anagapetus	50	400	1		
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1	0.0003	}
9/14/2022	2 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Ecclisomyia	50	400	1		
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.0026	j
9/14/2022	3 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOM/	ASS QC_COMMENTS
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1 0.0	0021
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Pagastia	50	400	1	
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1	
9/14/2022	2 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Orthocladius lignicola	50	400	1	
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Paraphaenocladius	50	400	1	
9/14/2022	4 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Tvetenia	50	400	1	
9/14/2022	3 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Macropelopia	50	400	1	
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Limoniidae	50	400	1 0.0	0016
9/14/2022	2 RG_GAUT_BICA-1-2022-09-14_N			Limnophila	50	400	1	
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Tipulidae	50	400	1 0.0	0016
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Tipula	50	400	1	
9/14/2022	RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Tipulidae	100	400	1 0.0	0772
9/14/2022	1 RG_GAUT_BICA-1-2022-09-14_N	RG_GAUT_BICA-1-2022-09-14_N	1/3 m ² kick & sweep	Tipula	100	400	1	
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Planariidae	50	400	1 0.0	0010
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Polycelis	50	400	1	
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Enchytraeidae	50	400	1 0.0	0001
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Naididae	50	400	1 0.0	0001
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Naididae	50	400	1	immature
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Lebertiidae	50	400	1 0.0	0001
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N			Lebertia	50	400	1	
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Sperchonidae	50	400	1 0.0	0001
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N			Sperchon	50	400	1	
9/14/2022	66 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Ostracoda	50	400	1 0.0	0115
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Collembola	50	400	1 0.0	0001
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Elmidae	50	400	1 0.0	0080
9/14/2022	6 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Heterlimnius	50	400	1	
9/14/2022	7 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	1	immature
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Capniidae	50	400	1 0.0	0112
9/14/2022	4 RG_GAUT_BICA-2-2022-09-14_N			Eucapnopsis			1	
· ·	35 RG_GAUT_BICA-2-2022-09-14_N			Paracapnia	50	400	1	
-, , -	30 RG_GAUT_BICA-2-2022-09-14_N			Capniidae			1	immature
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Nemouridae	50	400	1 0.0	0032
9/14/2022	7 RG_GAUT_BICA-2-2022-09-14_N			Zapada	50	400	1	
· ·	23 RG_GAUT_BICA-2-2022-09-14_N			Nemouridae			1	immature
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Perlodidae	50			0112
9/14/2022	3 RG_GAUT_BICA-2-2022-09-14_N			Isoperla	50		1	
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N			Megarcys	50		1	
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Perlodidae	100			0485
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N			Megarcys	100		1	
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Glossosomatidae	50			0110
	17 RG_GAUT_BICA-2-2022-09-14_N			Anagapetus	50		1	
· ·	23 RG_GAUT_BICA-2-2022-09-14_N			Glossosomatidae			1	immature
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Limnephilidae	50			0001
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N			Ecclisomyia			1	
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Rhyacophilidae	50			0095
9/14/2022	4 RG_GAUT_BICA-2-2022-09-14_N			Rhyacophila	50		1	
9/14/2022		RG_GAUT_BICA-2-2022-09-14_N		Ceratopogonidae	50			0001
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Ceratopogonidae	50	400	1	pupae

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.0018	3
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1		pupae
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Micropsectra	50	400	1		
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Limnophyes	50	400	1		
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Metriocnemus	50	400	1		
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Paraphaenocladius	50	400	1		
9/14/2022	3 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Tvetenia	50	400	1		
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Macropelopia	50	400	1		
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Empididae	50	400	1	0.0015	5
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/14/2022	2 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Wiedemannia	50	400	1		
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Limoniidae	50	400	1	0.0001	
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Limnophila	50	400	1		
9/14/2022	RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Tipulidae	100	400	1	0.0661	L
9/14/2022	1 RG_GAUT_BICA-2-2022-09-14_N	RG_GAUT_BICA-2-2022-09-14_N	1/3 m ² kick & sweep	Tipula	100	400	1		
9/14/2022	RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Planariidae	50	400	1	0.0071	
9/14/2022	2 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Polycelis	50	400	1		
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Naididae	50	400	1	0.0003	3
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Tubificinae	50	400	1		immature with hai
	B1 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Ostracoda	50	400	1	0.0085	, )
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Dytiscidae	50	400	1	0.0003	3
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Dytiscidae	50	400	1		immature
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	1	0.0142	2
9/14/2022	7 RG GAUT BICA-3-2022-09-14 N			Heterlimnius	50	400	1		
9/14/2022	3 RG GAUT BICA-3-2022-09-14 N			Elmidae	50	400	1		immature
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Capniidae	50	400	1	0.0175	,
	 14 RG_GAUT_BICA-3-2022-09-14_N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Eucapnopsis	50	400	1		
	11 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Paracapnia	50	400	1		
	77 RG GAUT BICA-3-2022-09-14 N			Capniidae	50				immature
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	0.0040	)
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N			Sweltsa	50		1		
9/14/2022	3 RG GAUT BICA-3-2022-09-14 N			Chloroperlidae	50		1		immature
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	0.0032	2
	13 RG GAUT BICA-3-2022-09-14 N			Zapada	50	400	1		
	16 RG GAUT BICA-3-2022-09-14 N			Nemouridae	50		1		immature
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.0245	
9/14/2022	2 RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/14/2022	3 RG GAUT BICA-3-2022-09-14 N			Megarcys	50				
9/14/2022	RG GAUT BICA-3-2022-09-14 N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Apataniidae	50	400	1	0.0086	;
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG GAUT BICA-3-2022-09-14 N	1/3 m ² kick & sweep	Allomyia	50	400	1		
9/14/2022		RG GAUT BICA-3-2022-09-14 N		Glossosomatidae	50	400	1	0.0022	2
9/14/2022	9 RG_GAUT_BICA-3-2022-09-14_N			Anagapetus	50		1		
9/14/2022		RG_GAUT_BICA-3-2022-09-14_N		Limnephilidae	50		1		5
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N			Limnephilidae	50		1		immature
9/14/2022		RG_GAUT_BICA-3-2022-09-14_N		Rhyacophilidae	50		1		
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N			Rhyacophila	50		1		
9/14/2022		RG GAUT BICA-3-2022-09-14 N	' '	Uenoidae	50		1		L
9/14/2022	1 RG GAUT BICA-3-2022-09-14 N			Neothremma	50		1		
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survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/14/2022	RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Ceratopogonidae	50	400	0.000	1
9/14/2022	2 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Bezzia	50	400	1	
9/14/2022	RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1 0.002	.1
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Brillia	50	400	Ĺ	
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Chaetocladius	50	400	1	
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Orthocladius lignicola	50	400	Ĺ	
9/14/2022	3 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1	
9/14/2022	RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Empididae	50	400	0.008	5
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	Ĺ	
9/14/2022	6 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Wiedemannia	50	400	1	
9/14/2022	RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Tipulidae	50	400	0.002	4
9/14/2022	1 RG_GAUT_BICA-3-2022-09-14_N	RG_GAUT_BICA-3-2022-09-14_N	1/3 m ² kick & sweep	Tipula	50	400	Ĺ	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Planariidae	50	400	1 0.031	2
9/14/2022	6 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Polycelis	50	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	100	400	0.097	4
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	Ĺ	
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Hygrobatidae	50	400	0.000	8
9/14/2022	3 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Hygrobates	50	400	Ĺ	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Lebertiidae	50	400	0.000	1
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Lebertia	50	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Sperchonidae	50	400	0.000	1
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Sperchon	50	400	Ĺ	
9/14/2022	56 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Ostracoda	50	400	0.010	1
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Dytiscidae	50	400	0.003	6
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Dytiscidae	50	400	Ĺ	adult
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	0.009	2
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Heterlimnius	50	400	Ĺ	
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	50	400	1	immature
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Ameletidae	50	400	0.000	1
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Ameletus	50	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Heptageniidae	100	400	0.009	3
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Cinygma	100	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Heptageniidae	50	400	0.012	.7
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Cinygma	50	400	1	immature
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Capniidae	50	400	0.006	3
9/14/2022	55 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Paracapnia	50	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	0.002	.3
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Sweltsa	50	400	Ĺ	
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	Ĺ	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	0.001	.6
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Zapada	50	400	Ĺ	
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	Ĺ	immature
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Perlodidae	100	400	1 0.055	5
9/14/2022	3 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Megarcys	100	400	1	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Perlodidae	50	400	1 0.002	.1
9/14/2022	3 RG_GAUT_BICA-4-2022-09-14_N			Isoperla	50	400	Ĺ	
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Apataniidae	50	400	0.000	2

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED N	1ESH PO	OOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Allomyia	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Glossosomatidae	50	400	1	0.0001	
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Anagapetus	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1	0.0001	
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1		immature
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.0137	,
9/14/2022	4 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.0006	;
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Micropsectra	50	400	1		
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Chaetocladius	50	400	1		
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Heleniella	50	400	1		
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Hydrobaenus	50	400	1		
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Orthocladius lignicola	50	400	1		
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Paraphaenocladius	50	400	1		
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Empididae	50	400	1	0.0081	
9/14/2022	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/14/2022	3 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Wiedemannia	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	1	0.0001	
9/14/2022	2 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Glutops	50	400	1		
9/14/2022	RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Tipulidae	50	400	1	0.0020	)
· · ·	1 RG_GAUT_BICA-4-2022-09-14_N	RG_GAUT_BICA-4-2022-09-14_N	1/3 m ² kick & sweep	Tipula	50	400	1		
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1	0.1390	)
9/14/2022	1 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1		
	3 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Lumbricidae	100	400	1		
9/14/2022	RG GAUT BICA-5-2022-09-14 N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Lebertiidae	100	400	1	0.0001	
9/14/2022	2 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Lebertia	100	400	1		
	3 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Ostracoda	100	400	1	0.0038	}
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Elmidae	100	400	1	0.0110	)
9/14/2022	5 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Heterlimnius	100	400	1		
· · ·	7 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Elmidae	100	400	1		immature
9/14/2022	RG GAUT BICA-5-2022-09-14 N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Heptageniidae	100	400	1	0.0063	}
· · ·		RG GAUT BICA-5-2022-09-14 N		Cinygma	100	400	1		
9/14/2022	RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Capniidae	100	400	1	0.0148	3
9/14/2022	1 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Eucapnopsis	100	400	1		
9/14/2022 1	5 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Paracapnia	100	400	1		
· · ·	1 RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Capniidae	100	400	1		immature
9/14/2022		RG GAUT BICA-5-2022-09-14 N	· ·	Chloroperlidae	100	400	1	0.0013	
9/14/2022	1 RG GAUT BICA-5-2022-09-14 N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Sweltsa	100	400	1		
		RG GAUT BICA-5-2022-09-14 N		Chloroperlidae	100	400	1		immature
9/14/2022	RG GAUT BICA-5-2022-09-14 N	RG GAUT BICA-5-2022-09-14 N	1/3 m ² kick & sweep	Nemouridae	100	400	1	0.0078	3
		RG_GAUT_BICA-5-2022-09-14_N		Zapada	100	400	1		
· · ·		RG_GAUT_BICA-5-2022-09-14_N		Nemouridae	100	400	1		immature
9/14/2022		RG GAUT BICA-5-2022-09-14 N		Perlodidae	100	400	1		
		RG_GAUT_BICA-5-2022-09-14_N		Isoperla	100	400	1		
· · ·		RG GAUT BICA-5-2022-09-14 N		Megarcys	100	400	1		
9/14/2022		RG GAUT BICA-5-2022-09-14 N		Glossosomatidae	100	400	1		
' '		RG GAUT BICA-5-2022-09-14 N	· ·	Anagapetus	100	400	1		
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survey date quant	ty observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED ME	SH POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/14/2022	2 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Glossosomatidae	100	400	1	
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1 0.0003	3
9/14/2022	1 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	immature
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophilidae	100	400	1 0.0539	)
9/14/2022	23 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1	
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	100	400	1 0.0002	2
9/14/2022	2 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Heleniella	100	400	1	
9/14/2022	1 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Zavrelimyia	100	400	1	
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Empididae	100	400	1 0.0001	l
9/14/2022	1 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Chelifera/Metachela	100	400	1	
9/14/2022	RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1 0.0001	L
9/14/2022	1 RG_GAUT_BICA-5-2022-09-14_N	RG_GAUT_BICA-5-2022-09-14_N	1/3 m ² kick & sweep	Glutops	100	400	1	
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Planariidae	50	400	1 0.0101	L
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Polycelis	50	400	1	
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1 0.2632	2
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Eiseniella tetraedra	50	400	1	
9/14/2022	2 RG GAUT BICA-6-2022-09-14 N	RG GAUT BICA-6-2022-09-14 N	1/3 m ² kick & sweep	Lumbricidae	50	400	1	
9/14/2022	RG GAUT BICA-6-2022-09-14 N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Lebertiidae	50	400	1 0.0005	5
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N			Lebertia	50	400	1	
9/14/2022		RG GAUT BICA-6-2022-09-14 N		Sperchonidae	50	400	1 0.0005	5
9/14/2022	1 RG GAUT BICA-6-2022-09-14 N			Sperchon	50	400	1	
9/14/2022	21 RG_GAUT_BICA-6-2022-09-14_N			Ostracoda	50	400	1 0.0041	l
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Elmidae	50		1 0.0104	
9/14/2022	6 RG GAUT BICA-6-2022-09-14 N			Heterlimnius	50	400	1	
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N			Elmidae	50	400	1	immature
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N			Staphylinidae	50	400	1 0.0010	)
9/14/2022		RG GAUT BICA-6-2022-09-14 N		Capniidae	50	400	1 0.0282	2
9/14/2022	5 RG_GAUT_BICA-6-2022-09-14_N			Eucapnopsis	50	400	1	
9/14/2022	46 RG_GAUT_BICA-6-2022-09-14_N			Paracapnia	50	400	1	
9/14/2022	153 RG_GAUT_BICA-6-2022-09-14_N			Capniidae	50	400	1	immature
9/14/2022		RG GAUT BICA-6-2022-09-14 N		Chloroperlidae	50	400	1 0.0007	7
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG GAUT BICA-6-2022-09-14 N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	immature
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Leuctridae	50	400	1 0.0001	
9/14/2022	3 RG GAUT BICA-6-2022-09-14 N			Leuctridae	50	400	1	immature
9/14/2022	RG GAUT BICA-6-2022-09-14 N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Nemouridae	50	400	1 0.0129	)
9/14/2022	18 RG_GAUT_BICA-6-2022-09-14_N			Zapada	50	400	1	
9/14/2022	36 RG GAUT BICA-6-2022-09-14 N	RG GAUT BICA-6-2022-09-14 N	1/3 m ² kick & sweep	Nemouridae	50	400	1	immature
9/14/2022	RG GAUT BICA-6-2022-09-14 N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Perlodidae	50	400	1 0.1495	5
9/14/2022	3 RG_GAUT_BICA-6-2022-09-14_N			Isoperla	50	400	1	
9/14/2022	13 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Megarcys	50	400	1	
9/14/2022		RG GAUT BICA-6-2022-09-14 N		Perlodidae	100	400	1 0.1064	1
9/14/2022	5 RG_GAUT_BICA-6-2022-09-14_N	RG GAUT BICA-6-2022-09-14 N	1/3 m ² kick & sweep	Megarcys	100	400	1	
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Glossosomatidae	50		1 0.0039	)
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N			Anagapetus	50		1	
9/14/2022	8 RG_GAUT_BICA-6-2022-09-14_N			Glossosomatidae	50	400	1	immature
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Limnephilidae	100		1 0.0758	
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N			Psychoglypha	100		1	
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Limnephilidae	50	400	1 0.1449	)
			-	•				

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	IESH POOL	.ED_REPS	MEASURED_BIOMAS	S QC_COMMENTS
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Psychoglypha	50	400	1		
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1		immature
9/14/2022		RG_GAUT_BICA-6-2022-09-14_N		Rhyacophilidae	100	400	1	0.01	04
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1		
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.06	55
9/14/2022	8 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Ceratopogonidae	50	400	1	0.00	07
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Probezzia	50	400	1		
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.00	09
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Limnophyes	50	400	1		
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Tvetenia	50	400	1		
9/14/2022	1 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Zavrelimyia	50	400	1		
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Dixidae	50	400	1	0.00	10
9/14/2022	2 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Dixa	50	400	1		
9/14/2022	RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Empididae	50	400	1	0.01	10
9/14/2022 1	7 RG_GAUT_BICA-6-2022-09-14_N	RG_GAUT_BICA-6-2022-09-14_N	1/3 m ² kick & sweep	Wiedemannia	50	400	1		
9/10/2022	3 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Nematoda	50	400	1	0.00	04
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Planariidae	50	400	1	0.00	36
9/10/2022	7 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Polycelis	50	400	1		
		RG_GHBP_BICA-1_2022-09-10_N		Enchytraeidae	50	400	1	0.00	02
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1	0.30	89
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1	0.01	55
9/10/2022	4 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1		
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Lumbricidae	100	400	1		immature
9/10/2022	6 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Lumbricidae	50	400	1		immature
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Lebertiidae	50	400	1	0.00	03
9/10/2022		RG_GHBP_BICA-1_2022-09-10_N		Lebertia	50	400	1		
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Ostracoda	50	400	1	0.00	01
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Gammaridae	50	400	1	0.00	24
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Gammarus	50	400	1		
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Collembola	50	400	1	0.00	01
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Elmidae	50	400	1	0.00	22
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Heterlimnius	50	400	1		
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Baetidae	50	400	1	0.04	45
9/10/2022 6	7 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Baetis	50	400	1		
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Heptageniidae	50	400	1	0.00	53
9/10/2022	1 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Rhithrogena	50	400	1		
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	0.00	43
9/10/2022	3 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Sweltsa	50	400	1		
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Nemouridae	50	400	1	0.06	10
9/10/2022 1	5 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Malenka	50	400	1		
9/10/2022 7	8 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Zapada	50	400	1		
9/10/2022 1	5 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Nemouridae	50	400	1		immature
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.00	21
9/10/2022	2 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Isoperla	50	400	1		
9/10/2022	4 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Perlodidae	50	400	1		immature
9/10/2022	RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Brachycentridae	50	400	1	0.00	03
9/10/2022	2 RG_GHBP_BICA-1_2022-09-10_N	RG_GHBP_BICA-1_2022-09-10_N	1/3 m ² kick & sweep	Micrasema	50	400	1		

survey date qu	antity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Rhyacophilidae	50	400	1 0.2367	,
9/10/2022	40 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Rhyacophila	50	400	1	
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Chironomidae	50	400	1 0.0203	}
9/10/2022	4 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Chironomidae	50	400	1	pupae
9/10/2022	2 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Micropsectra	50	400	1	
9/10/2022	4 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pseudodiamesa	50	400	1	
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Corynoneura	50	400	1	
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Eukiefferiella	50	400	1	
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Hydrobaenus	50	400	1	
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Tvetenia	50	400	1	
9/10/2022	2 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pentaneura	50	400	1	
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Empididae	50	400	1 0.0019	)
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Empididae	50	400	1	pupae
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Psychodidae	50	400	1 0.0069	)
9/10/2022	41 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pericoma	50	400	1	
9/10/2022	41 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Simuliidae	50	400	1 0.0502	!
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pediciidae	50	400	1 0.0001	
9/10/2022	1 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Dicranota	50	400	1	
9/10/2022	RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pisidiidae	50	400	1 0.1538	3
9/10/2022	124 RG_GHBP_BICA-1_2022-09	-10_N RG_GHBP_BICA-1_2022-09-10	_N 1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Planariidae	50	400	1 0.0053	}
9/12/2022	5 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Polycelis	50	400	1	
9/12/2022	3 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Enchytraeidae	50	400	1 0.0008	3
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Lumbricidae	100	400	1 0.1868	3
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Lumbricidae	50	400	1 0.0151	
9/12/2022	2 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1	
9/12/2022	1 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Lumbricidae	100	400	1	immature
9/12/2022	1 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Lumbricidae	50	400	1	immature
9/12/2022	1 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Ostracoda	50	400	1 0.0001	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Gammaridae	100	400	1 0.1227	,
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Gammaridae	50	400	1 0.0266	;
9/12/2022	2 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Gammarus	100	400	1	
9/12/2022	1 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Gammarus	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Elmidae	50	400	1 0.0001	
9/12/2022	1 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Heterlimnius	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Baetidae	50	400	1 0.0234	<b>!</b>
9/12/2022	32 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Baetis	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Chloroperlidae	50	400	1 0.0094	}
9/12/2022	2 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Sweltsa	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Nemouridae	50	400	1 0.0211	
9/12/2022	4 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Malenka	50	400	1	
9/12/2022		-12_N RG_GHBP_BICA-2_2022-09-12	_ ,	Zapada	50		1	
9/12/2022	8 RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Nemouridae	50	400	1	immature
9/12/2022		-12_N RG_GHBP_BICA-2_2022-09-12		Perlodidae	50		1 0.0002	!
9/12/2022		-12_N RG_GHBP_BICA-2_2022-09-12		Perlodidae	50		1	immature
9/12/2022		-12_N RG_GHBP_BICA-2_2022-09-12		Brachycentridae	50	400	1 0.0007	,
9/12/2022		-12_N RG_GHBP_BICA-2_2022-09-12		Micrasema	50		1	
9/12/2022	RG_GHBP_BICA-2_2022-09	-12_N RG_GHBP_BICA-2_2022-09-12	_N 1/3 m ² kick & sweep	Rhyacophilidae	100	400	1 0.0218	3

survey date quar	ntity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	H POOLED_REPS	MEASURED_BIOMAS	S QC_COMMENTS
9/12/2022	RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophilidae	50	400	1 0.18	08
9/12/2022	1 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1	
9/12/2022	37 RG_GHBP_BICA-2_2022-09-12_N			Rhyacophila	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Chironomidae	50	400	1 0.00	55
9/12/2022	7 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	pupae
9/12/2022	11 RG_GHBP_BICA-2_2022-09-12_N			Micropsectra	50	400	1	
9/12/2022	1 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Eukiefferiella	50	400	1	
9/12/2022	1 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Macropelopia	50	400	1	
9/12/2022	1 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Pentaneura	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Psychodidae	50	400	1 0.02	78
9/12/2022	118 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Pericoma	50	400	1	
9/12/2022	31 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Simuliidae	50	400	1 0.02	04
9/12/2022	RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Pediciidae	50	400	1 0.00	10
9/12/2022	3 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Dicranota	50	400	1	
9/12/2022	RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Pisidiidae	50	400	1 0.08	02
9/12/2022	72 RG_GHBP_BICA-2_2022-09-12_N	N RG_GHBP_BICA-2_2022-09-12_N	1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	50	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Planariidae	25	400	1 0.02	08
9/12/2022	16 RG_GHBP_BICA-3_2022-09-12_N			Polycelis	25	400	1	
9/12/2022	7 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Enchytraeidae	25	400	1 0.00	14
9/12/2022	RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Lumbricidae	25	400	1 0.05	90
9/12/2022	1 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Eiseniella tetraedra	100	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Lebertiidae	25	400	1 0.00	05
9/12/2022	2 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Lebertia	25	400	1	
9/12/2022	1 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Ostracoda	25	400	1 0.00	01
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Elmidae	25	400	1 0.00	36
9/12/2022	2 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Heterlimnius	25	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Baetidae	25	400	1 0.03	11
9/12/2022	46 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Baetis	25	400	1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Callibaetis	25		1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Chloroperlidae	25	400	1 0.00	76
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Sweltsa	25	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Nemouridae	25	400	1 0.02	05
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N	· ·	Malenka	25	400	1	
9/12/2022	20 RG_GHBP_BICA-3_2022-09-12_N		· ·	Zapada	25	400	1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Nemouridae	25		1	immature
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N	· ·	Perlodidae	25		1 0.00	10
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Perlodidae	25		1	immature
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Brachycentridae	25		1 0.00	15
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Micrasema	25		1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Rhyacophilidae	100		1 0.063	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Rhyacophilidae	25		1 0.20	15
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Rhyacophila	100		1	
9/12/2022	39 RG_GHBP_BICA-3_2022-09-12_N			Rhyacophila	25		1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Chironomidae	25		1 0.00	60
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Chironomidae	25		1	pupae
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N		Micropsectra	25		1	
9/12/2022		N RG_GHBP_BICA-3_2022-09-12_N	· ·	Corynoneura	25		1	
9/12/2022	2 RG_GHBP_BICA-3_2022-09-12_N	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m² kick & sweep	Eukiefferiella	25	400	1	

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	ESH POOLED_REP	5 MEASURED_BIO	MASS QC_COMMENTS
9/12/2022	1 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Heleniella	25	400	1	
9/12/2022	1 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pentaneura	25	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pelecorhyncidae	25	400	1 (	0.0046
9/12/2022	4 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Glutops	25	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Psychodidae	25	400	1 (	0.0277
9/12/2022	91 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pericoma	25	400	1	
9/12/2022	19 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Simuliidae	25	400	1 (	0.0188
9/12/2022	RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pediciidae	25	400	1 (	0.0035
9/12/2022	5 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Dicranota	25	400	1	
9/12/2022	RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pisidiidae	25	400	1 (	0.0996
9/12/2022	52 RG_GHBP_BICA-3_2022-09-12_	N RG_GHBP_BICA-3_2022-09-12_N	1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	25	400	1	
9/12/2022	5 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Nematoda	25	400	1 (	0.0005
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Planariidae	25	400	1 (	0.0534
9/12/2022	57 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Polycelis	25	400	1	
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Planariidae	25	400	1	indeterminate
9/12/2022	8 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Enchytraeidae	25	400	1 (	0.0015
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Lumbricidae	25	400	1 (	0.0030
9/12/2022		N RG_GHBP_BICA-4_2022-09-12_N		Lumbricidae	25	400	1	immature
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Lebertiidae	25	400	1 (	0.0001
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Lebertia	25	400	1	
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Ostracoda	25	400	1 (	0.0001
9/12/2022		N RG_GHBP_BICA-4_2022-09-12_N		Gammaridae	100	400	1 (	0.0121
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Gammaridae	25	400	1 (	0.0080
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Gammarus	100	400	1	
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Gammarus	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Elmidae	25	400	1 (	0.0013
9/12/2022	3 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Heterlimnius	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Baetidae	25	400	1 (	0.0153
9/12/2022	30 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Baetis	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Chloroperlidae	25	400	1 (	0.0120
9/12/2022	8 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Sweltsa	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Leuctridae	25	400	1 (	0.0002
9/12/2022	2 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Leuctridae	25	400	1	immature
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Nemouridae	25	400	1 (	0.0247
9/12/2022	7 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Malenka	25	400	1	
9/12/2022	14 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Zapada	25	400	1	
9/12/2022	6 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Nemouridae	25	400	1	immature
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Perlodidae	25	400	1 (	0.0004
9/12/2022	4 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Perlodidae	25	400	1	immature
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophilidae	25	400	1 (	0.3692
9/12/2022	49 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophila	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Chironomidae	25	400	1 (	0.0029
9/12/2022	2 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Chironomidae	25	400	1	pupae
9/12/2022	7 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Micropsectra	25	400	1	
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Eukiefferiella	25	400	1	
9/12/2022		N RG_GHBP_BICA-4_2022-09-12_N		Heleniella	25	400	1	
9/12/2022	1 RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Tvetenia	25	400	1	
9/12/2022	RG_GHBP_BICA-4_2022-09-12_	N RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1 (	0.0290

survey date quanti	ty	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIG	MASS QC_COMMENTS
9/12/2022		RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pelecorhyncidae	25	4	-00	1	0.0127
9/12/2022	2	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Glutops	100	4	-00	1	
9/12/2022	3	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Glutops	25	4	-00	1	
9/12/2022		RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Psychodidae	25	4	-00	1	0.0555
9/12/2022	238	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pericoma	25	4	-00	1	
9/12/2022	43	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Simuliidae	25	4	-00	1	0.0472
9/12/2022		RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pediciidae	25	4	-00	1	0.0010
9/12/2022	6	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Dicranota	25	4	-00	1	
9/12/2022		RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pisidiidae	25	4	-00	1	0.0804
9/12/2022	66	RG_GHBP_BICA-4_2022-09-12_N	RG_GHBP_BICA-4_2022-09-12_N	1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	25	4	00	1	
9/12/2022	2	RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Nematoda	50	4	-00	1	0.0009
9/12/2022	1	RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Platyhelminthes	50	4	-00	1	0.0010
9/12/2022		RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Planariidae	50	4	-00	1	0.0193
9/12/2022	19	RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Polycelis	50	4	00	1	
9/12/2022	1	RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Planaridae	50	4	00	1	indeterminate
9/12/2022		RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Lumbricidae	50	4	00	1	0.0223
9/12/2022	1	RG_GHBP_BICA-5_2022-09-12_N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Lumbricidae	50	4	00	1	immature
9/12/2022			RG_GHBP_BICA-5_2022-09-12_N		Lebertiidae	50	4	-00	1	0.0009
9/12/2022	3		RG_GHBP_BICA-5_2022-09-12_N		Lebertia	50	4	-00	1	
9/12/2022			RG_GHBP_BICA-5_2022-09-12_N		Sperchontidae	50	4	-00	1	0.0009
9/12/2022	1		RG_GHBP_BICA-5_2022-09-12_N		Sperchon	50	4	-00	1	
9/12/2022			RG GHBP BICA-5 2022-09-12 N		Ostracoda	50	4	-00	1	0.0010
9/12/2022		RG GHBP BICA-5 2022-09-12 N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Gammaridae	50	4	-00	1	0.0183
9/12/2022	3		N RG GHBP BICA-5 2022-09-12 N	· ·	Gammarus	50	4	-00	1	
9/12/2022			RG_GHBP_BICA-5_2022-09-12_N		Baetidae	50	4	00	1	0.0499
9/12/2022	69		RG_GHBP_BICA-5_2022-09-12_N		Baetis	50	4	-00	1	
9/12/2022			N RG GHBP BICA-5 2022-09-12 N		Chloroperlidae	50	4	-00	1	0.0019
9/12/2022	2		RG_GHBP_BICA-5_2022-09-12_N		Sweltsa	50	4	-00	1	
9/12/2022			N RG GHBP BICA-5 2022-09-12 N		Leuctridae	50	4	00	1	0.0007
9/12/2022	1	RG GHBP BICA-5 2022-09-12 N	RG GHBP BICA-5 2022-09-12 N	1/3 m ² kick & sweep	Leuctridae	50	4	-00	1	immature
9/12/2022		RG GHBP BICA-5 2022-09-12 N	N RG GHBP BICA-5 2022-09-12 N	1/3 m ² kick & sweep	Nemouridae	50	4	-00	1	0.0229
9/12/2022	6		N RG GHBP BICA-5 2022-09-12 N	· ·	Malenka	50	4	-00	1	
9/12/2022	7	RG GHBP BICA-5 2022-09-12 N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Zapada	50	4	-00	1	
9/12/2022			N RG GHBP BICA-5 2022-09-12 N	· ·	Brachycentridae	50	4	-00	1	0.0020
9/12/2022	10		N RG GHBP BICA-5 2022-09-12 N	· ·	Micrasema	50	4	00	1	
9/12/2022		RG GHBP BICA-5 2022-09-12 N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophilidae	50	4	-00	1	0.0702
9/12/2022	10		N RG GHBP BICA-5 2022-09-12 N	· ·	Rhyacophila	50	4	-00	1	
9/12/2022		RG GHBP BICA-5 2022-09-12 N	RG GHBP BICA-5 2022-09-12 N	1/3 m ² kick & sweep	Chironomidae	50	4	-00	1	0.0040
9/12/2022	2	RG GHBP BICA-5 2022-09-12 N	RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Chironomidae	50	4	-00	1	pupae
9/12/2022			RG_GHBP_BICA-5_2022-09-12_N		Micropsectra	50	4	00	1	
9/12/2022	1	RG GHBP BICA-5 2022-09-12 N	N RG GHBP BICA-5 2022-09-12 N	1/3 m ² kick & sweep	Eukiefferiella	50	4	-00	1	
9/12/2022			N RG GHBP BICA-5 2022-09-12 N		Pentaneura	50			1	
9/12/2022			N RG GHBP BICA-5 2022-09-12 N	'	Empididae	50	4	00	1	0.0016
9/12/2022	1		RG GHBP BICA-5 2022-09-12 N	· ·	Chelifera/Metachela	50			- 1	
9/12/2022	_		RG_GHBP_BICA-5_2022-09-12_N		Pelecorhyncidae	50			- 1	0.0010
9/12/2022	2		RG_GHBP_BICA-5_2022-09-12_N	'	Glutops	50			- 1	
9/12/2022			RG GHBP BICA-5 2022-09-12 N		Psychodidae	50			- 1	0.0223
9/12/2022	98		RG GHBP BICA-5 2022-09-12 N	· ·	Pericoma	50			1	
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survey date quanti	ty observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED ME	SH POOLED_REPS	MEASURED_BIOMAS	S QC_COMMENTS
9/12/2022	12 RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Simuliidae	50	400	1 0.01	51
9/12/2022		12_N RG_GHBP_BICA-5_2022-09-12_N		Pediciidae	50	400	1 0.00	09
9/12/2022	1 RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Dicranota	50	400	1	
9/12/2022	RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Planorbidae	50	400	1 0.00	06
9/12/2022	1 RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Gyraulus	50	400	1	
9/12/2022	RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Pisidiidae	50	400	1 0.04	66
9/12/2022	67 RG_GHBP_BICA-5_2022-09-:	12_N RG_GHBP_BICA-5_2022-09-12_N	1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	50	400	1	
9/12/2022	RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Planariidae	100	400	1 0.02	80
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Polycelis	100	400	1	
9/12/2022	4 RG GHBP BICA-6 2022-09-	12 N RG GHBP BICA-6 2022-09-12 N	1/3 m ² kick & sweep	Enchytraeidae	100	400	1 0.00	07
9/12/2022	RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Lebertiidae	100	400	1 0.00	16
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Lebertia	100	400	1	
9/12/2022	RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Sperchonidae	100	400	1 0.00	04
9/12/2022	3 RG GHBP BICA-6 2022-09-:	12 N RG GHBP BICA-6 2022-09-12 N	1/3 m ² kick & sweep	Sperchon	100	400	1	
9/12/2022	RG GHBP BICA-6 2022-09-:	12 N RG GHBP BICA-6 2022-09-12 N	1/3 m ² kick & sweep	Torrenticolidae	100	400	1 0.00	01
9/12/2022	1 RG GHBP BICA-6 2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Torrenticolidae	100	400	1	indeterminate
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Baetidae	100	400	1 0.06	26
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N	' · · · · · · · · · · · · · · · · · ·	Baetis	100	400	1	
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Chloroperlidae	100	400	1 0.00	06
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Sweltsa	100	400	1	
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Nemouridae	100		1 0.03	38
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Malenka	100		1	
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N	· ·	Zapada	100	400	1	
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N	'	Nemouridae	100	400	1	immature
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Perlodidae	100	400	1 0.00	
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N	1 1	Perlodidae	100	400	1	immature
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Brachycentridae	100	400	1 0.01	
9/12/2022		12 N RG GHBP BICA-6 2022-09-12 N		Micrasema	100	400	1	
9/12/2022	RG GHBP BICA-6 2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Hydropsychidae	100	400	1 0.00	05
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Cheumatopsyche	100	400	1	
9/12/2022		 12_N RG_GHBP_BICA-6_2022-09-12_N		Lepidostomatidae	100	400	1 0.00	01
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Lepidostoma	100	400	1	
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Rhyacophilidae	100	400	1 0.03	72
9/12/2022	13 RG GHBP BICA-6 2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1	
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Chironomidae	100	400	1 0.00	19
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Micropsectra	100	400	1	
9/12/2022	2 RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Nanocladius	100	400	1	
9/12/2022	RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Empididae	100	400	1 0.00	10
9/12/2022	1 RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Chelifera/Metachela	100	400	1	
9/12/2022	RG_GHBP_BICA-6_2022-09-2	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Psychodidae	100	400	1 0.00	95
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Pericoma	100	400	1	
9/12/2022	29 RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Simuliidae	100	400	1 0.03	76
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Limoniidae	100	400	1 0.00	32
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Antocha	100	400	1	
9/12/2022	RG_GHBP_BICA-6_2022-09-:	12_N RG_GHBP_BICA-6_2022-09-12_N	1/3 m ² kick & sweep	Pediciidae	100	400	1 0.00	07
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Dicranota	100	400	1	
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Planorbidae	100	400	1 0.00	10
9/12/2022		12_N RG_GHBP_BICA-6_2022-09-12_N		Gyraulus	100	400	1	

survey date quantity	observ_sample_	_code	LAB_SAMPLE	_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/12/2022	RG_GHBP_BICA	A-6_2022-09-12_N	RG_GHBP_BI	CA-6_2022-09-12_N	1/3 m ² kick & sweep	Pisidiidae	100	4	00 1	1 0.0771	1
9/12/2022					1/3 m ² kick & sweep	Pisidium (Cyclocalyx)	100	4	00 1	1	
9/9/2022	1 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Nematoda	12.5	4	00 1	0.0001	1
9/9/2022	3 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Polycelis	12.5	4	00 1	0.0039	9
9/9/2022	14 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Enchytraeidae	12.5	4	00 1	0.0008	3
9/9/2022	RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Trombidiformes	12.5	4	00 1	0.0002	2
9/9/2022	1 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Trombidiformes	12.5	4	00 1	1	indeterminate
9/9/2022	34 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Ostracoda	12.5	4	00 1	0.0057	7
9/9/2022	1 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Collembola	12.5	4	00 1	0.0001	1
9/9/2022	RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Capniidae	12.5	4	00 1	0.0111	1
9/9/2022	1 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Mesocapnia	12.5	4	00 1	1	
9/9/2022	24 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Paracapnia	12.5	4	00 1	Ĺ	
9/9/2022	29 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Capniidae	12.5	4	00 1	1	immature
9/9/2022	RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	12.5	4	00 1	1 0.0002	2
9/9/2022	1 RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	12.5	4	00 1	1	immature
9/9/2022	RG_GHNF_BICA	A-1_2022-09-09_N	RG_GHNF_BI	CA-1_2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	12.5	4	00 1	0.0020	)
9/9/2022	2 RG GHNF BICA	A-1 2022-09-09 N	RG GHNF BI	CA-1 2022-09-09 N	1/3 m ² kick & sweep	Malenka	12.5	4	00 1	1	
9/9/2022	RG GHNF BICA	A-1 2022-09-09 N	RG GHNF BI	CA-1 2022-09-09 N	1/3 m ² kick & sweep	Perlodidae	12.5	4	00 1	1 0.0326	5
					1/3 m ² kick & sweep	Isoperla	12.5	4	00 1	1	
9/9/2022					1/3 m ² kick & sweep	Brachycentridae	12.5	4	00 1	0.0002	2
9/9/2022					1/3 m ² kick & sweep	Brachycentrus	12.5	4	00 1	1	
9/9/2022	RG GHNF BICA	A-1 2022-09-09 N	RG GHNF BI	CA-1 2022-09-09 N	1/3 m ² kick & sweep	Chironomidae	12.5	4	00 1	1 0.0488	3
9/9/2022					1/3 m ² kick & sweep	Chironomidae	12.5		00 1	1	pupae
9/9/2022	2 RG GHNF BICA	A-1 2022-09-09 N	RG GHNF BI	CA-1 2022-09-09 N	1/3 m ² kick & sweep	Micropsectra	12.5	4	00 1	1	• •
9/9/2022					1/3 m ² kick & sweep	Pseudodiamesa	12.5		00 1	1	
9/9/2022					1/3 m ² kick & sweep	Corynoneura	12.5	4	00 1	1	
9/9/2022					1/3 m ² kick & sweep	Cricotopus/Orthocladius	12.5			1	
9/9/2022					1/3 m ² kick & sweep	Eukiefferiella	12.5	4	00 1	1	
					1/3 m ² kick & sweep	Heleniella	12.5	4	00 1	1	
					1/3 m ² kick & sweep	Hydrobaenus	12.5		00 1	1	
					1/3 m ² kick & sweep	Tvetenia	12.5	4	00 1	1	
9/9/2022					1/3 m ² kick & sweep	Zavrelimyia	12.5			1	
9/9/2022					1/3 m ² kick & sweep	Empididae	12.5		00 1	0.0063	3
9/9/2022					1/3 m ² kick & sweep	Chelifera/Metachela	12.5	4	00 1		
9/9/2022					1/3 m ² kick & sweep	Pelecorhyncidae	12.5			0.0250	)
9/9/2022					1/3 m ² kick & sweep	Glutops	12.5	4	00 1		
9/9/2022					1/3 m ² kick & sweep	Psychodidae	12.5	4	00 1	0.0010	)
9/9/2022					1/3 m ² kick & sweep	Pericoma	12.5	4	00 1		
9/9/2022					1/3 m ² kick & sweep	Pediciidae	12.5	4	00 1	0.0051	1
9/9/2022					1/3 m ² kick & sweep	Dicranota	12.5		00 1		
9/9/2022					1/3 m ² kick & sweep	Planariidae	25	4	00 1	0.0246	5
					1/3 m ² kick & sweep	Polycelis	25		00 1		
					1/3 m ² kick & sweep	Enchytraeidae	25			0.0013	3
9/9/2022					1/3 m ² kick & sweep	Sperchonidae	25				
9/9/2022					1/3 m ² kick & sweep	Sperchon	25				
					1/3 m ² kick & sweep	Ostracoda	25			1 0.0256	5
9/9/2022					1/3 m ² kick & sweep	Capniidae	25		00 1		
9/9/2022					1/3 m ² kick & sweep	Paracapnia	25				-
3,3,2022			0b1		1 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	<del> </del>	23			•	

survey date quantity	observ_	_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	1ESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/9/2022	2 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Capniidae	25	40	00 1	Ĺ	immature
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	25	40	00 1	0.0021	L
9/9/2022	4 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Sweltsa	25	40	00 1	L	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Leuctridae	25	40	00 1	0.0001	l
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Leuctridae	25	40	00 1	L	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	25	40	00 1	0.0001	L
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	25	40	00 1	Ĺ	immature
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Perlodidae	25	40	00 1	0.0105	5
9/9/2022 1	2 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Isoperla	25	40	00 1	L	
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Perlodidae	25	40	00 1	L	immature
9/9/2022			N RG_GHNF_BICA-2_2022-09-09_N		Taeniopterygidae	25	40	00 1	0.0001	L
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Taeniopterygidae	25	40	00 1	L	immature
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Limnephilidae	25	40	00 1	0.0013	3
9/9/2022 1	0 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Limnephilidae	25	40	00 1	L	immature
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	25	40	00 1	0.0098	3
9/9/2022 1	7 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	25	40	00 1	L	pupae
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Micropsectra	25	40	00 1	Ĺ	
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Pseudodiamesa	25	40	00 1	Ĺ	
9/9/2022	3 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Heleniella	25	40	00 1	Ĺ	
9/9/2022	8 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Hydrobaenus	25	40	00 1	i	
9/9/2022	2 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Tvetenia	25	40	00 1	i	
9/9/2022	3 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Zavrelimyia	25	40	00 1	i	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Empididae	25	40	00 1	1 0.0144	1
9/9/2022 2	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Chelifera/Metachela	25	40	00 1	i	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Pelecorhyncidae	100	40	00 1	0.1655	5
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Pelecorhyncidae	25	40	00 1	0.0086	5
9/9/2022	7 RG GH	NF BICA-2 2022-09-09	N RG GHNF BICA-2 2022-09-09 N	1/3 m ² kick & sweep	Glutops	100	40	00 1	i	
9/9/2022 1	2 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Glutops	25	40	00 1	i	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Psychodidae	25	40	00 1	0.0019	)
9/9/2022	7 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Pericoma	25	40	00 1	Ĺ	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Pediciidae	25	40	00 1	0.0001	L
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Dicranota	25	40	00 1	i	
9/9/2022	RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Limoniidae	25	40	00 1	1 0.0025	5
9/9/2022	1 RG_GH	NF_BICA-2_2022-09-09_	N RG_GHNF_BICA-2_2022-09-09_N	1/3 m ² kick & sweep	Limnophila	25	40	00 1	i	
9/10/2022	RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Planariidae	100	40	00 1	1 0.0024	1
9/10/2022	1 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Polycelis	100	40	00 1	i	
9/10/2022	1 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Enchytraeidae	100	40	00 1	0.0004	1
9/10/2022	6 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Ostracoda	100	40	00 1	0.0015	5
9/10/2022	1 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Collembola	100	40	00 1	1 0.0002	2
9/10/2022	1 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Staphylinidae	100	40	00 1	0.0014	1
9/10/2022	RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Capniidae	100	40	00 1	0.0049	)
9/10/2022	2 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Mesocapnia	100	40	00 1	i	
9/10/2022	3 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Capniidae	100	40	00 1	Ĺ	immature
9/10/2022			N RG_GHNF_BICA-3_2022-09-10_N		Nemouridae	100	40	00 1	0.0005	5
9/10/2022			N RG_GHNF_BICA-3_2022-09-10_N		Nemouridae	100	40	00 1	l	immature
9/10/2022	RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Perlodidae	100	40	00 1	0.1249	)
9/10/2022 3	5 RG_GH	NF_BICA-3_2022-09-10	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Isoperla	100	40	00 1	l	
9/10/2022	9 RG_GH	NF_BICA-3_2022-09-10_	N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Megarcys	100	40	00 1	1	

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED N	1ESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/10/2022	2 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Perlodidae	100	400	:	L	immature
9/10/2022	RG_GHNF_BICA-3_2022-09-10	O_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Limnephilidae	100	400	:	0.0002	
9/10/2022	1 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Limnephilidae	100	400	:	L	immature
9/10/2022	RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Chironomidae	100	400	:	0.0108	
9/10/2022	19 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Chironomidae	100	400	:	L	pupae
9/10/2022	5 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Pagastia	100	400	:	l	
9/10/2022	2 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Brillia	100	400	:	L	
9/10/2022	1 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	400	:	L	
9/10/2022	1 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Eukiefferiella	100	400	:	l	
9/10/2022	17 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Tvetenia	100	400	:	L	
9/10/2022	RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Empididae	100	400	:	0.0148	
9/10/2022	9 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Chelifera/Metachela	100	400	:	l	
9/10/2022	1 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Wiedemannia	100	400	:	l	
9/10/2022	3 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Empididae	100	400	:	L	pupae
9/10/2022	RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Pelecorhyncidae	100	400	:	0.0008	
9/10/2022	1 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Glutops	100	400	:	L	
9/10/2022	RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Psychodidae	100	400	:	0.0011	
9/10/2022		_N RG_GHNF_BICA-3_2022-09-10_N		Pericoma	100	400	:	L	
9/10/2022	RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	N 1/3 m ² kick & sweep	Pediciidae	100	400	:	0.0006	
9/10/2022	2 RG_GHNF_BICA-3_2022-09-10	_N RG_GHNF_BICA-3_2022-09-10_N	1/3 m ² kick & sweep	Dicranota	100	400		Į.	
9/10/2022	2 RG_GHNF_BICA-4_2022-09-10	N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Nematoda	6.25	400		0.0001	
9/10/2022	RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Planariidae	6.25	400	:	0.0030	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Polycelis	6.25	400	:	L	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Enchytraeidae	6.25	400	:	0.0002	
9/10/2022		O_N RG_GHNF_BICA-4_2022-09-10_N		Ostracoda	6.25	400		0.0021	
9/10/2022	RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Capniidae	6.25	400		0.0065	
9/10/2022	3 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Mesocapnia	6.25	400		Į.	
9/10/2022	4 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Paracapnia	6.25	400		Į.	
9/10/2022	20 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Capniidae	6.25	400	:	L	immature
9/10/2022	RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Nemouridae	6.25	400	:	0.0015	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Zapada	6.25	400		Į.	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Nemouridae	6.25	400		Į.	immature
9/10/2022		O_N RG_GHNF_BICA-4_2022-09-10_N		Perlodidae	100	400		0.0236	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Megarcys	100	400		Į.	
9/10/2022	RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Perlodidae	6.25	400	:	0.0225	
9/10/2022	31 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Isoperla	6.25	400	:	L	
9/10/2022	RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Chironomidae	6.25	400		0.0376	
9/10/2022	3 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Chironomidae	6.25	400	:	L	pupae
9/10/2022	8 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Pagastia	6.25	400	:	L	
9/10/2022		_N RG_GHNF_BICA-4_2022-09-10_N		Pseudodiamesa	6.25	400	:	L	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Brillia	6.25	400		Į.	
9/10/2022	1 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Cricotopus/Orthocladius	6.25	400		Į.	
9/10/2022	6 RG_GHNF_BICA-4_2022-09-10	O_N RG_GHNF_BICA-4_2022-09-10_N	N 1/3 m ² kick & sweep	Hydrobaenus	6.25	400		Į.	
		 )_N RG_GHNF_BICA-4_2022-09-10_N		Tvetenia	6.25	400	:	L	
9/10/2022		 )_N RG_GHNF_BICA-4_2022-09-10_N		Empididae	6.25	400	:	0.0039	
9/10/2022		 )_N RG_GHNF_BICA-4_2022-09-10_N		Chelifera/Metachela	6.25	400	:	l	
9/10/2022		 )_N RG_GHNF_BICA-4_2022-09-10_N		Empididae	6.25	400	:	L	
9/10/2022		 )_N RG_GHNF_BICA-4_2022-09-10_N		Psychodidae	6.25	400	:	0.0006	

survey date quanti	cy observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH I	OOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/10/2022	2 RG_GHNF_BICA-4_2022-09-1	0_N RG_GHNF_BICA-4_2022-09-10_I	N 1/3 m ² kick & sweep	Pericoma	6.25	400	1		
9/10/2022	RG_GHNF_BICA-4_2022-09-1	0_N RG_GHNF_BICA-4_2022-09-10_I	N 1/3 m ² kick & sweep	Pediciidae	6.25	400	1	0.0021	
9/10/2022	2 RG_GHNF_BICA-4_2022-09-1	0_N RG_GHNF_BICA-4_2022-09-10_I	N 1/3 m ² kick & sweep	Dicranota	6.25	400	1		
9/10/2022	1 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Enchytraeidae	6.25	400	1	0.0002	!
9/10/2022	3 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Staphylinidae	6.25	400	1	0.0028	}
9/10/2022	RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Capniidae	6.25	400	1	0.0012	!
9/10/2022	6 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Capniidae	6.25	400	1		immature
9/10/2022		0_N RG_GHNF_BICA-5_2022-09-10_I		Perlodidae	6.25	400	1	0.0113	}
9/10/2022	17 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Isoperla	6.25	400	1		
9/10/2022	RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Taeniopterygidae	6.25	400	1	0.0001	
9/10/2022	1 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Taeniopterygidae	6.25	400	1		immature
9/10/2022	RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Chironomidae	6.25	400	1	0.0314	ŀ
9/10/2022	12 RG_GHNF_BICA-5_2022-09-1	0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Chironomidae	6.25	400	1		pupae
9/10/2022	19 RG GHNF BICA-5 2022-09-1	0 N RG GHNF BICA-5 2022-09-10 I	N 1/3 m ² kick & sweep	Pagastia	6.25	400	1		•
9/10/2022	1 RG GHNF BICA-5 2022-09-1	 0_N RG_GHNF_BICA-5_2022-09-10_I	N 1/3 m ² kick & sweep	Brillia	6.25	400	1		
9/10/2022		0_N RG_GHNF_BICA-5_2022-09-10_I		Cricotopus/Orthocladius	6.25	400	1		
9/10/2022		0 N RG GHNF BICA-5 2022-09-10 I		Eukiefferiella	6.25	400	1		
		0_N RG_GHNF_BICA-5_2022-09-10_I		Tvetenia	6.25	400	1		
9/10/2022		0_N RG_GHNF_BICA-5_2022-09-10_I		Empididae	6.25	400	1	0.0077	,
9/10/2022		0 N RG GHNF BICA-5 2022-09-10 I		Chelifera/Metachela	6.25	400	1		
9/10/2022		0 N RG GHNF BICA-5 2022-09-10 I		Empididae	6.25	400	1		pupae
9/10/2022		0 N RG GHNF BICA-5 2022-09-10 I		Psychodidae	6.25	400	1	0.0021	
9/10/2022		0 N RG GHNF BICA-5 2022-09-10 I		Pericoma	6.25	400	1		
9/10/2022		0_N RG_GHNF_BICA-5_2022-09-10_I		Pediciidae	6.25	400	-	0.0005	
9/10/2022		0_N RG_GHNF_BICA-5_2022-09-10_I	_	Dicranota	6.25	400	- 1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-11	1/3 m ² kick & sweep	Planariidae	6.25	400	-	0.0031	
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-12	1/3 m ² kick & sweep	Polycelis	6.25	400	-		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-13	1/3 m ² kick & sweep	Enchytraeidae	6.25	400	-		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-14	1/3 m ² kick & sweep	Ostracoda	6.25	400	-		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-15	1/3 m ² kick & sweep	Capniidae	6.25	400	-		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-17	1/3 m ² kick & sweep	Paracapnia	6.25	400	-		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-18	1/3 m ² kick & sweep	Capniidae	6.25	400	- 1	•	immature
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-19	1/3 m ² kick & sweep	Nemouridae	6.25	400	- 1	0.0016	
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-20	1/3 m ² kick & sweep	Malenka	6.25		- 1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-22	1/3 m ² kick & sweep	Nemouridae	6.25		-	•	immature
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-23	1/3 m ² kick & sweep	Perlodidae	100	400	- 1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-24	1/3 m ² kick & sweep	Megarcys	100	400	- 1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-25	1/3 m ² kick & sweep	Perlodidae	6.25		-	0.0238	1
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-26	1/3 m ² kick & sweep	Isoperla	6.25		- 1	****	
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-27	1/3 m ² kick & sweep	Perlodidae	6.25	400	-	•	indeterminate
9/10/2022		0 N RG GHNF BICA-6 2022-09-28	1/3 m ² kick & sweep	Chironomidae	6.25		- 1		
9/10/2022		0 N RG GHNF BICA-6 2022-09-29	1/3 m ² kick & sweep	Chironomidae	6.25		- 1		pupae
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-30	1/3 m ² kick & sweep	Pagastia	6.25		1		L-1600
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-31	1/3 m ² kick & sweep	Pseudodiamesa	6.25		1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-32	1/3 m ² kick & sweep	Heleniella	6.25				
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-33	1/3 m ² kick & sweep	Hydrobaenus	6.25			•	
		0 N RG GHNF BICA-6 2022-09-34	1/3 m ² kick & sweep	Tvetenia	6.25	400	1		
9/10/2022		0_N RG_GHNF_BICA-6_2022-09-35	1/3 m ² kick & sweep	Empididae	6.25	400	1		
3/10/2022	NO_01111 _D1CA 0_2022-09-1	0_11 NO_01111 _DIGN 0_2022-09-33	2,0 .// Nick & 544CCP	p.uiuuc	0.23	100	-	3.0100	•

survey date qua	ntity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	ESH POOLED_REP	S MEASURED_BIOMASS	QC_COMMENTS
9/10/2022	5 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-36	1/3 m ² kick & sweep	Chelifera/Metachela	6.25	400	1	
9/10/2022	1 RG_GHNF_BICA-6_2022-09-10	N_RG_GHNF_BICA-6_2022-09-37	1/3 m ² kick & sweep	Clinocera	6.25	400	1	
9/10/2022	2 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-38	1/3 m ² kick & sweep	Empididae	6.25	400	1	pupae
9/10/2022	RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-39	1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1 0.067	2
9/10/2022	RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-40	1/3 m ² kick & sweep	Pelecorhyncidae	6.25	400	1 0.018	7
9/10/2022	3 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-41	1/3 m ² kick & sweep	Glutops	100	400	1	
9/10/2022	1 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-42	1/3 m ² kick & sweep	Glutops	6.25	400	1	
9/10/2022	RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-43	1/3 m ² kick & sweep	Psychodidae	6.25	400	1 0.000	2
9/10/2022	1 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-44	1/3 m ² kick & sweep	Pericoma	6.25	400	1	
9/10/2022	RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-45	1/3 m ² kick & sweep	Pediciidae	6.25	400	1 0.001	8
9/10/2022	RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-46	1/3 m ² kick & sweep	Antocha	6.25	400	1	
9/10/2022	3 RG_GHNF_BICA-6_2022-09-10	_N RG_GHNF_BICA-6_2022-09-47	1/3 m ² kick & sweep	Dicranota	6.25	400	1	
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Planariidae	25	400	1 0.007	1
9/16/2022	2 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	1/3 m ² kick & sweep	Polycelis	25	400	1	
9/16/2022	12 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Ostracoda	25	400	1 0.003	1
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Collembola	25	400	1 0.000	1
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Elmidae	25	400	1 0.000	1
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Heterlimnius	25	400	1	
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Capniidae	25	400	1 0.004	2
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Mesocapnia	25	400	1	
9/16/2022	2 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	1/3 m ² kick & sweep	Paracapnia	25	400	1	
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Capniidae	25	400	1	immature
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Nemouridae	25	400	1 0.002	2
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	1/3 m ² kick & sweep	Zapada	25	400	1	
9/16/2022	3 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Nemouridae	25	400	1	immature
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Perlodidae	25	400	1 0.012	0
9/16/2022	6 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	1/3 m ² kick & sweep	Isoperla	25	400	1	
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Taeniopterygidae	25	400	1 0.001	2
9/16/2022	4 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Taeniopterygidae	25	400	1	immature
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Limnephilidae	25	400	1 0.005	8
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Ecclisomyia	25	400	1	
9/16/2022	2 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Limnephilidae	25	400	1	immature
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Rhyacophilidae	25	400	1 0.004	5
9/16/2022	2 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Rhyacophila	25	400	1	
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Chironomidae	25	400	1 0.016	4
9/16/2022	4 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Chironomidae	25	400	1	pupae
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Micropsectra	25	400	1	
9/16/2022	3 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Pagastia	25	400	1	
9/16/2022	1 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Cricotopus/Orthocladius	25	400	1	
9/16/2022	16 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Eukiefferiella	25	400	1	
9/16/2022	6 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Hydrobaenus	25	400	1	
9/16/2022	3 RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Tvetenia	25	400	1	
9/16/2022		5_N RG_GHDT_BICA-1_2022-09-16_N	•	Empididae	25	400	1 0.016	0
9/16/2022		5_N RG_GHDT_BICA-1_2022-09-16_N	•	Chelifera/Metachela	25	400	1	
9/16/2022		5_N RG_GHDT_BICA-1_2022-09-16_N		Empididae	25	400	1	pupae
9/16/2022		5_N RG_GHDT_BICA-1_2022-09-16_N		Pelecorhyncidae	25	400	1 0.000	1
9/16/2022		5_N RG_GHDT_BICA-1_2022-09-16_N		Glutops	25	400	1	
9/16/2022	RG_GHDT_BICA-1_2022-09-16	5_N RG_GHDT_BICA-1_2022-09-16_N	I 1/3 m ² kick & sweep	Psychodidae	25	400	1 0.001	5

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
	4 RG_GHDT_BICA-1_2022-09-16_N	RG GHDT BICA-1 2022-09-16 N	I 1/3 m ² kick & sween	Pericoma	_ 25	100	1	
9/16/2022		NRG GHDT BICA-2 2022-09-16 N		Planariidae			1 0.0003	<b>\$</b>
	1 RG_GHDT_BICA-2_2022-09-16_N			Polycelis			1	
9/16/2022		NRG GHDT BICA-2 2022-09-16 N		Lebertiidae			1 0.0001	1
	1 RG_GHDT_BICA-2_2022-09-16_N			Lebertia			1	
	2 RG_GHDT_BICA-2_2022-09-16_N			Ostracoda			1 0.0007	,
	1 RG GHDT BICA-2 2022-09-16 N			Collembola			1 0.0003	
9/16/2022		RG_GHDT_BICA-2_2022-09-16_N		Capniidae			1 0.0012	
	1 RG_GHDT_BICA-2_2022-09-16_N			Mesocapnia			1	
	2 RG GHDT BICA-2 2022-09-16 N			Capniidae	50	100	1	immature
9/16/2022		RG GHDT BICA-2 2022-09-16 N		Nemouridae	50	100	1 0.0043	}
9/16/2022	3 RG GHDT BICA-2 2022-09-16 N	N RG GHDT BICA-2 2022-09-16 N	I Petite Ponar	Zapada	50	100	1	
9/16/2022	7 RG GHDT BICA-2 2022-09-16 N	N RG GHDT BICA-2 2022-09-16 N	I Petite Ponar	Nemouridae	50	100	1	immature
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Perlodidae	100	100	1 0.0376	ز
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Perlodidae	50	100	1 0.0200	)
9/16/2022	12 RG GHDT BICA-2 2022-09-16 N	N RG GHDT BICA-2 2022-09-16 N	I Petite Ponar	Isoperla	50	100	1	
9/16/2022	3 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Megarcys	100	100	1	
9/16/2022	1 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Perlodidae	50	100	1	immature
9/16/2022	RG GHDT BICA-2 2022-09-16 N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Taeniopterygidae	50	100	1 0.0015	;
	9 RG_GHDT_BICA-2_2022-09-16_N			Taeniopterygidae	50	100	1	immature
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Limnephilidae	50	100	1 0.0064	ł
9/16/2022	1 RG_GHDT_BICA-2_2022-09-16_N	N RG GHDT BICA-2 2022-09-16 N	I Petite Ponar	Ecclisomyia	50	100	1	
	1 RG_GHDT_BICA-2_2022-09-16_N			Limnephilidae	50	100	1	immature
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Chironomidae	50	100	1 0.0309	)
9/16/2022	19 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Chironomidae	50	100	1	pupae
9/16/2022	20 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Pagastia	50	100	1	
9/16/2022	1 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Brillia	50	100	1	
9/16/2022	3 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Cricotopus/Orthocladius	50	100	1	
9/16/2022	97 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Eukiefferiella	50	100	1	
9/16/2022	15 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Tvetenia	50	100	1	
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Empididae	50	100	1 0.0035	<del>,</del>
9/16/2022	6 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Chelifera/Metachela	50	100	1	
9/16/2022	RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Pediciidae	50	100	1 0.0001	
9/16/2022	1 RG_GHDT_BICA-2_2022-09-16_N	N RG_GHDT_BICA-2_2022-09-16_N	I Petite Ponar	Dicranota	50	100	1	
9/16/2022	2 RG_GHDT_BICA-3_2022-09-16_N	N RG_GHDT_BICA-3_2022-09-16_N	I 1/3 m ² kick & sweep	Ostracoda	100	100	1 0.0001	1
9/16/2022	RG GHDT BICA-3 2022-09-16 N	N RG GHDT BICA-3 2022-09-16 N	I 1/3 m ² kick & sweep	Capniidae	100	100	1 0.0001	L
9/16/2022	1 RG GHDT BICA-3 2022-09-16 N	N RG GHDT BICA-3 2022-09-16 N	1 1/3 m ² kick & sweep	Capniidae	100	100	1	immature
9/16/2022		N RG_GHDT_BICA-3_2022-09-16_N		Nemouridae			1 0.0047	
	1 RG GHDT BICA-3_2022-09-16 N			Zapada			1 0.0047	
	3 RG GHDT BICA-3_2022-09-16_N		· · · · · · · · · · · · · · · · · · ·	Nemouridae			1	ina manda una
								immature
9/16/2022		N RG_GHDT_BICA-3_2022-09-16_N		Perlodidae			1 0.2516	)
	1 RG_GHDT_BICA-3_2022-09-16_N		· · · · · · · · · · · · · · · · · · ·	Isoperla			1	
9/16/2022	6 RG_GHDT_BICA-3_2022-09-16_N			Megarcys	100	100	1	
9/16/2022	RG_GHDT_BICA-3_2022-09-16_N	N RG_GHDT_BICA-3_2022-09-16_N	I 1/3 m ² kick & sweep	Taeniopterygidae	100	100	1 0.0004	i
9/16/2022	6 RG_GHDT_BICA-3_2022-09-16_N	N RG_GHDT_BICA-3_2022-09-16_N	I 1/3 m ² kick & sweep	Taeniopterygidae	100	100	1	immature
9/16/2022	RG_GHDT_BICA-3_2022-09-16 N	N RG_GHDT_BICA-3_2022-09-16_N	I 1/3 m ² kick & sweep	Limnephilidae	100	100	1 0.0003	3
	1 RG_GHDT_BICA-3_2022-09-16_N			Limnephilidae			1	immature
9/16/2022		RG GHDT BICA-3 2022-09-16 N		Chironomidae			1 0.0417	
	RG_GHDT_BICA-3_2022-09-10_1 14 RG_GHDT_BICA-3_2022-09-16_N			Chironomidae			1 0.0417	pupae
	5 RG GHDT_BICA-3_2022-09-16_N			Pagastia			1	pupae
				-				
9/16/2022	24 RG_GHDT_BICA-3_2022-09-16_N	N KG_GHD1_BICA-3_2022-09-16_N	ו בו⊥ m⁻ kick & sweep	Cricotopus/Orthocladius	100	100	1	

survey date qua	ntity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/16/2022	114 RG GHDT BICA-3 2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	V 1/3 m ² kick & sweep	Eukiefferiella	100	4	00	L –	• -
9/16/2022		-16 N RG GHDT BICA-3 2022-09-16 N		Tvetenia	100	4	00 1	l	
9/16/2022	RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	1/3 m ² kick & sweep	Dixidae	100	4	00 1	0.0013	
9/16/2022	1 RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	1/3 m ² kick & sweep	Dixa	100	4	00 1	l	
9/16/2022	RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	1 1/3 m ² kick & sweep	Empididae	100	4	00 1	0.0013	
9/16/2022	1 RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	V 1/3 m ² kick & sweep	Empididae	100	4	00 1	l	pupae
9/16/2022	RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	1/3 m ² kick & sweep	Psychodidae	100	4	00 1	0.0001	
9/16/2022	1 RG_GHDT_BICA-3_2022-09	-16_N RG_GHDT_BICA-3_2022-09-16_N	1 1/3 m ² kick & sweep	Pericoma	100	4	00 1	l	
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Planariidae	100	4	00 1	0.0023	
9/16/2022	3 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Polycelis	100	4	00 1	l	
9/16/2022	2 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Enchytraeidae	100	4	00 1	0.0004	
9/16/2022		-16_N RG_GHDT_BICA-4_2022-09-16_N		Lebertiidae	100	4	00 1	0.0006	
9/16/2022	2 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Lebertia	100	4	00 1	l	
9/16/2022	7 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Ostracoda	100	4	00 1	0.0022	
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	V 1/3 m ² kick & sweep	Ephemerellidae	100	4	00 1	0.0001	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Ephemerellidae	100	4	00 1	l	immature
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Capniidae	100	4	00 1	0.0044	
9/16/2022	4 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Paracapnia	100	4	00 1	l	
9/16/2022	4 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Capniidae	100	4	00 1	l	immature
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Nemouridae	100	4	00 1	0.0029	
9/16/2022	3 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Zapada	100	4	00 1	l	
9/16/2022	5 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Nemouridae	100	4	00 1	l	immature
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Perlodidae	100	4	00 1	0.0140	
9/16/2022	8 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Isoperla	100	4	00 1	l	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Perlodidae	100	4	00 1	l	immature
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Taeniopterygidae	100	4	00 1	0.0003	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Taeniopterygidae	100	4	00 1	l	immature
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	V 1/3 m ² kick & sweep	Limnephilidae	100	4	00 1	0.0316	
9/16/2022	3 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Ecclisomyia	100	4	00 1	l	
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Rhyacophilidae	100	4	00 1	0.0001	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Rhyacophila	100	4	00 1	l	
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Chironomidae	100	4	00 1	0.0149	
9/16/2022		-16_N RG_GHDT_BICA-4_2022-09-16_N		Chironomidae	100	4	00 1	L	pupae
9/16/2022	2 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Micropsectra	100	4	00 1	l	
9/16/2022	13 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Pagastia	100	4	00 1	L	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Pseudodiamesa	100	4	00 1	L	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Chaetocladius	100	4	00 1	L	
9/16/2022	3 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	4	00 1	L	
9/16/2022	15 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Eukiefferiella	100	4	00 1	L	
9/16/2022	3 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Hydrobaenus	100	4	00 1	Ĺ	
9/16/2022	5 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Tvetenia	100	4	00 1	L	
9/16/2022	2 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Zavrelimyia	100	4	00 1	L	
9/16/2022	RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Empididae	100	4	00 1	0.0091	
9/16/2022	11 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Chelifera/Metachela	100	4	00 1	Ĺ	
9/16/2022		-16_N RG_GHDT_BICA-4_2022-09-16_N		Pelecorhyncidae	100	4	00 1	0.0001	
9/16/2022	1 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Glutops	100	4	00 1	l	
9/16/2022		-16_N RG_GHDT_BICA-4_2022-09-16_N		Psychodidae	100	4	00 1	0.0007	
9/16/2022	5 RG_GHDT_BICA-4_2022-09	-16_N RG_GHDT_BICA-4_2022-09-16_N	1/3 m ² kick & sweep	Pericoma	100	4	00 1	L	

survey date quantity	y observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED M	IESH POOLI	ED_REPS 1	MEASURED_BIOMASS	QC_COMMENTS
9/16/2022	RG_GHDT_BICA-4_2022-09-	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Pediciidae	100	400	1	0.0002	
9/16/2022	1 RG_GHDT_BICA-4_2022-09-	-16_N RG_GHDT_BICA-4_2022-09-16_N	I 1/3 m ² kick & sweep	Dicranota	100	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Planariidae	50	400	1	0.0050	
9/16/2022	6 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Polycelis	50	400	1		
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Enchytraeidae	50	400	1	0.0001	
9/16/2022	11 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Ostracoda	50	400	1	0.0048	
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Capniidae	50	400	1	0.0045	
9/16/2022	7 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Paracapnia	50	400	1		
9/16/2022	4 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Capniidae	50	400	1		immature
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1	0.0001	
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Chloroperlidae	50	400	1		immature
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Nemouridae	50	400	1	0.0002	
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	l 1/3 m ² kick & sweep	Zapada	50	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Perlodidae	50	400	1	0.1532	
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Isoperla	50	400	1		
9/16/2022	4 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Megarcys	50	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Taeniopterygidae	50	400	1	0.0005	
9/16/2022	5 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Taeniopterygidae	50	400	1		immature
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Limnephilidae	50	400	1	0.0687	
9/16/2022	8 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Ecclisomyia	50	400	1		
9/16/2022	5 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Limnephilidae	50	400	1		immature
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Rhyacophilidae	50	400	1	0.0011	
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Rhyacophila	50	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Chironomidae	50	400	1	0.0157	
9/16/2022	8 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Chironomidae	50	400	1		pupae
9/16/2022	24 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Pagastia	50	400	1		
9/16/2022	8 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1		
9/16/2022	21 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Eukiefferiella	50	400	1		
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Hydrobaenus	50	400	1		
9/16/2022	11 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Tvetenia	50	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Empididae	50	400	1	0.0029	
9/16/2022	7 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	l 1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1		
9/16/2022	1 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Empididae	50	400	1		immature
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Pelecorhyncidae	50	400	1	0.0008	
9/16/2022	3 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	l 1/3 m ² kick & sweep	Glutops	50	400	1		
9/16/2022		-16_N RG_GHDT_BICA-5_2022-09-16_N		Psychodidae	50	400	1	0.0002	
9/16/2022	4 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Pericoma	50	400	1		
9/16/2022	RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	I 1/3 m ² kick & sweep	Pediciidae	50	400	1	0.0001	
9/16/2022	2 RG_GHDT_BICA-5_2022-09-	-16_N RG_GHDT_BICA-5_2022-09-16_N	1/3 m ² kick & sweep	Dicranota	50	400	1		
9/16/2022		-16_N RG_GHDT_BICA-6_2022-09-16_N		Planariidae	100	400	1	0.0119	
9/16/2022	3 RG_GHDT_BICA-6_2022-09-	-16_N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Polycelis	100	400	1		
9/16/2022	2 RG_GHDT_BICA-6_2022-09-	-16_N RG_GHDT_BICA-6_2022-09-16_N	I 1/3 m ² kick & sweep	Enchytraeidae	100	400	1	0.0001	
9/16/2022	2 RG_GHDT_BICA-6_2022-09-	-16_N RG_GHDT_BICA-6_2022-09-16_N	I 1/3 m ² kick & sweep	Ostracoda	100	400	1	0.0001	
9/16/2022		-16_N RG_GHDT_BICA-6_2022-09-16_N		Capniidae	100	400	1	0.0002	
9/16/2022	2 RG_GHDT_BICA-6_2022-09-	-16_N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Paracapnia	100	400	1		
9/16/2022		-16_N RG_GHDT_BICA-6_2022-09-16_N		Capniidae	100	400	1		immature
9/16/2022		-16_N RG_GHDT_BICA-6_2022-09-16_N		Nemouridae	100	400	1	0.0020	
9/16/2022	5 RG_GHDT_BICA-6_2022-09-	-16_N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Zapada	100	400	1		

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MI	ESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Nemouridae	100	400	1	1	immature
9/16/2022	RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Perlodidae	100	400	1	1 0.0578	
9/16/2022	2 RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Isoperla	100	400	1	I	
9/16/2022	3 RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Megarcys	100	400	1	I	
9/16/2022	RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Taeniopterygidae	100	400	1	1 0.0001	
9/16/2022	3 RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Taeniopterygidae	100	400	1	1	immature
9/16/2022	RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Hydropsychidae	100	400	1	1 0.0001	
9/16/2022	1 RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Hydropsychidae	100	400	1	1	immature
9/16/2022	RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	1 0.0001	
9/16/2022	2 RG GHDT BICA-6 2022-09-16	N RG GHDT BICA-6 2022-09-16 N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	ı	immature
9/16/2022	RG_GHDT_BICA-6_2022-09-16_	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Rhyacophilidae	100	400	1	1 0.0001	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Rhyacophila	100	400	1		
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Chironomidae	100	400	1	1 0.0238	
		N RG GHDT BICA-6 2022-09-16 N		Chironomidae	100	400	1	1	pupae
, ,		N RG GHDT BICA-6 2022-09-16 N		Pagastia	100	400	1	ı	
9/16/2022	9 RG GHDT BICA-6 2022-09-16	N RG_GHDT_BICA-6_2022-09-16_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	400	1	ı	
		N RG GHDT BICA-6 2022-09-16 N		Eukiefferiella	100	400	1	1	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Heleniella	100	400	1	1	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Hydrobaenus	100	400	1	1	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Tvetenia	100	400	1	1	
9/16/2022		N RG GHDT BICA-6 2022-09-16 N		Zavrelimyia	100	400	1	1	
9/16/2022		N RG GHDT BICA-6 2022-09-16 N		Empididae	100	400	1	="	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N	1.1	Chelifera/Metachela	100	400	1		
9/16/2022		N RG GHDT BICA-6 2022-09-16 N		Empididae	100	400	1		pupae
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Pelecorhyncidae	100	400	1	='	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N		Glutops	100	400	1		
9/16/2022		N RG GHDT BICA-6 2022-09-16 N		Psychodidae	100	400	1	='	
9/16/2022		N RG GHDT BICA-6 2022-09-16 N		Pericoma	100	400	1		
9/16/2022		N RG GHDT BICA-6 2022-09-16 N	1.1	Pediciidae	100	400	1	="	
9/16/2022		N RG_GHDT_BICA-6_2022-09-16_N	1.1	Dicranota	100	400	1		
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Nematoda	100	400	1		
9/8/2022		N RG GHFF BICA-1-2022-09-08 N	· ·	Planariidae	100	400	1		
9/8/2022		N RG_GHFF_BICA-1-2022-09-08_N		Polycelis	100	400	1		
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Enchytraeidae	100	400	1	='	
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Ostracoda	100	400	1		
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Ephemerellidae	100	400	1		
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Ephemerellidae	100	400	1		immature
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Heptageniidae	100	400	1	="	
9/8/2022		N RG GHFF BICA-1-2022-09-08 N		Heptageniidae	100	400	1		immature
9/8/2022		N RG_GHFF_BICA-1-2022-09-08_N		Capniidae	100	400	1	="	
9/8/2022		N RG_GHTBICA-1-2022-09-08_N N RG_GHFF_BICA-1-2022-09-08_N		Capniidae	100	400	1		immature
9/8/2022		RG_GHFF_BICA-1-2022-09-08_N RG_GHFF_BICA-1-2022-09-08_N	· ·	Nemouridae	100	400	1	="	
9/8/2022		RG_GHFF_BICA-1-2022-09-08_N		Zapada	100	400	1	0.0101	
				Nemouridae			1	="	inama atu wa
		N RG_GHFF_BICA-1-2022-09-08_N		Perlodidae	100 100	400 400	1	="	immature
9/8/2022 9/8/2022		N RG_GHFF_BICA-1-2022-09-08_N N RG GHFF BICA-1-2022-09-08 N		Isoperla	100	400	1		
				•			1	-	
9/8/2022 9/8/2022		N RG_GHFF_BICA-1-2022-09-08_N N RG GHFF BICA-1-2022-09-08 N	· ·	Megarcys Perlodidae	100 100	400 400	1	="	immature
9/0/2022	1 KG_GULL_DICH-1-5055-08-0	N KG_GULL_BTCH-1-5055-03-08_N	1/3 III KICK & SWeep	reilluiude	100	400	1	•	immature

survey date quanti	ty observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH P	OOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Taeniopterygidae	100	400	1	0.0001	
9/8/2022	2 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Taeniopterygidae	100	400	1	_	immature
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Hydropsychidae	100	400	1	0.0002	
9/8/2022	1 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Hydropsychidae	100	400	1	_	immature
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	0.0004	
9/8/2022	5 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	_	immature
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Rhyacophilidae	100	400	1	0.0199	
9/8/2022	5 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Rhyacophila	100	400	1	_	
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Chironomidae	100	400	1	0.0431	
9/8/2022	20 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Chironomidae	100	400	1	_	pupae
9/8/2022	5 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Micropsectra	100	400	1	_	
9/8/2022	43 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Pagastia	100	400	1	_	
9/8/2022	8 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	400	1	_	
9/8/2022	120 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Eukiefferiella	100	400	1	_	
9/8/2022	1 RG_GHFF_BICA-1-2022-09-08_N			Hydrobaenus	100	400	1	_	
9/8/2022	3 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Tvetenia	100	400	1	_	
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Empididae	100	400	1	0.0266	
9/8/2022	15 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Chelifera/Metachela	100	400	1	_	
9/8/2022	3 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Clinocera	100	400	1	_	
9/8/2022	3 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Empididae	100	400	1	_	pupae
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1	0.0008	
9/8/2022	1 RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Glutops	100	400	1	_	
9/8/2022	RG_GHFF_BICA-1-2022-09-08_N	RG_GHFF_BICA-1-2022-09-08_N	1/3 m ² kick & sweep	Psychodidae	100	400	1	0.0008	
9/8/2022	5 RG_GHFF_BICA-1-2022-09-08_N	RG GHFF BICA-1-2022-09-08 N	1/3 m ² kick & sweep	Pericoma	100	400	1		
9/8/2022	2 RG_GHFF_BICA-02-2022-09-08_N			Nematoda	100	400	1	0.0003	
9/8/2022		N RG_GHFF_BICA-02-2022-09-08_N		Planariidae	100	400	1	0.0304	
9/8/2022	27 RG GHFF BICA-02-2022-09-08 N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Polycelis	100	400	1		
9/8/2022	9 RG_GHFF_BICA-02-2022-09-08_N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Enchytraeidae	100	400	1	0.0017	
9/8/2022	8 RG_GHFF_BICA-02-2022-09-08_N			Ostracoda	100	400	1	0.0023	
9/8/2022	RG_GHFF_BICA-02-2022-09-08_N	N RG_GHFF_BICA-02-2022-09-08_N	1/3 m ² kick & sweep	Elmidae	100	400	1	0.0002	
9/8/2022	1 RG GHFF BICA-02-2022-09-08 N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Elmidae	100	400	1		immature
9/8/2022	RG_GHFF_BICA-02-2022-09-08_N	N RG_GHFF_BICA-02-2022-09-08_N	1/3 m ² kick & sweep	Ephemerellidae	100	400	1	0.0005	
9/8/2022	4 RG_GHFF_BICA-02-2022-09-08_N			Ephemerellidae	100	400	1	_	immature
9/8/2022	RG GHFF BICA-02-2022-09-08 N	N RG_GHFF_BICA-02-2022-09-08_N	1/3 m ² kick & sweep	Heptageniidae	100	400	1	0.0006	
9/8/2022	3 RG_GHFF_BICA-02-2022-09-08_N			Cinygmula	100	400	1		
9/8/2022		N RG_GHFF_BICA-02-2022-09-08_N		Capniidae	100	400	1	0.0008	
9/8/2022	2 RG GHFF BICA-02-2022-09-08 N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Paracapnia	100	400	1		
9/8/2022	3 RG GHFF BICA-02-2022-09-08 N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Capniidae	100	400	1		immature
9/8/2022	RG GHFF BICA-02-2022-09-08 N	N RG_GHFF_BICA-02-2022-09-08_N	1/3 m ² kick & sweep	Chloroperlidae	100	400	1	0.0013	
9/8/2022	3 RG_GHFF_BICA-02-2022-09-08_N			Chloroperlidae	100	400	1	_	immature
9/8/2022		NRG GHFF BICA-02-2022-09-08 N		Nemouridae	100	400	1	0.0189	
9/8/2022	4 RG GHFF BICA-02-2022-09-08 N	NRG GHFF BICA-02-2022-09-08 N	1/3 m ² kick & sweep	Zapada	100	400	1		
9/8/2022	25 RG_GHFF_BICA-02-2022-09-08_N	NRG GHFF BICA-02-2022-09-08 N	1 1/3 m ² kick & sweep	Nemouridae	100	400	1		immature
9/8/2022		N RG_GHFF_BICA-02-2022-09-08_N		Perlodidae	100	400	1	0.3464	
9/8/2022	2 RG_GHFF_BICA-02-2022-09-08_N			Isoperla	100	400	1		
9/8/2022	20 RG_GHFF_BICA-02-2022-09-08_N			Megarcys	100	400	1		
9/8/2022	1 RG_GHFF_BICA-02-2022-09-08_N			Perlodidae	100	400	1		immature
9/8/2022	RG_GHFF_BICA-02-2022-09-08_N	N RG_GHFF_BICA-02-2022-09-08_N	1/3 m ² kick & sweep	Limnephilidae	100	400	1	0.0041	

survey date quantit	y observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/8/2022	1 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Ecclisomyia	100	40	0 1	Ĺ	
9/8/2022		08_N RG_GHFF_BICA-02-2022-09-08_N		Limnephilidae	100	40	0 1	ĺ	immature
9/8/2022	RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Rhyacophilidae	100	40	0 1	0.2688	}
9/8/2022	22 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Rhyacophila	100	40	0 1	ĺ	
9/8/2022	RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Chironomidae	100	40	0 1	0.0331	
9/8/2022	33 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Chironomidae	100	40	0 1	Ĺ	pupae
9/8/2022	41 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Pagastia	100	40	0 1	ĺ	
9/8/2022	3 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	40	0 1	Ĺ	
9/8/2022	45 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Eukiefferiella	100	40	0 1	Ĺ	
9/8/2022	5 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Tvetenia	100	40	0 1	ĺ	
9/8/2022	RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Empididae	100	40	0 1	0.0392	!
9/8/2022	43 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Chelifera/Metachela	100	40	0 1	ĺ	
9/8/2022	4 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Empididae	100	40	0 1	ĺ	pupae
9/8/2022	RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	1 1/3 m ² kick & sweep	Pelecorhyncidae	100	40	0 1	0.0009	)
9/8/2022	3 RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Glutops	100	40	0 1	Ĺ	
9/8/2022	RG_GHFF_BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Psychodidae	100	40	0 1	0.0013	}
9/8/2022	9 RG GHFF BICA-02-2022-09-0	08 N RG GHFF BICA-02-2022-09-08 N	1 1/3 m ² kick & sweep	Pericoma	100	40	0 1	1	
9/8/2022	RG GHFF BICA-02-2022-09-0	08_N RG_GHFF_BICA-02-2022-09-08_N	I 1/3 m ² kick & sweep	Pediciidae	100	40	0 1	0.0007	,
9/8/2022		08 N RG GHFF BICA-02-2022-09-08 N		Dicranota	100	40	0 1		
9/8/2022	3 RG GHFF BICA-3-2022-09-08	B N RG GHFF BICA-3-2022-09-08 N	1/3 m ² kick & sweep	Nematoda	100	40	0 1	1 0.0002	!
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Planariidae	100	40	0 1	1 0.0033	}
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Polycelis	100	40			
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Enchytraeidae	100	40	0 1	0.0002	!
9/8/2022	RG GHFF BICA-3-2022-09-08	B N RG GHFF BICA-3-2022-09-08 N	1/3 m ² kick & sweep	Lebertiidae	100	40	0 1	0.0004	}
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Lebertia	100	40	0 1		
9/8/2022		B_N RG_GHFF_BICA-3-2022-09-08_N		Ostracoda	100	40	0 1	0.0020	)
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Capniidae	100	40			
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Capniidae	100	40	0 1		immature
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Nemouridae	100	40	0 1	0.0031	
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Zapada	100	40	0 1		
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Nemouridae	100	40	0 1	l	immature
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Perlodidae	100	40		1 0.0025	
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Isoperla	100	40	0 1	1	
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Perlodidae	100	40	0 1	1	immature
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Taeniopterygidae	100	40	0 1	0.0002	
9/8/2022	1 RG GHFF BICA-3-2022-09-08	 B_N RG_GHFF_BICA-3-2022-09-08_N	1/3 m ² kick & sweep	Taeniopterygidae	100	40	0 1	1	immature
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Limnephilidae	100	40	0 1	0.0003	
9/8/2022		B_N RG_GHFF_BICA-3-2022-09-08_N		Limnephilidae	100	40	0 1		immature
9/8/2022		 B_N RG_GHFF_BICA-3-2022-09-08_N		Chironomidae	100	40	0 1	0.0602	!
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Chironomidae	100	40	0 1	1	pupae
9/8/2022	36 RG GHFF BICA-3-2022-09-08		1/3 m ² kick & sweep	Pagastia	100	40	0 1	1	
9/8/2022		B N RG GHFF BICA-3-2022-09-08 N		Cricotopus/Orthocladius	100	40	0 1	1	
		B_N RG_GHFF_BICA-3-2022-09-08_N		Eukiefferiella	100	40		1	
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Tvetenia	100	40	0 1	1	
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Empididae	100	40		1 0.0122	!
9/8/2022		B_N RG_GHFF_BICA-3-2022-09-08_N		Chelifera/Metachela	100	40			
9/8/2022		8 N RG GHFF BICA-3-2022-09-08 N		Empididae	100	40		1	pupae
9/8/2022		B_N RG_GHFF_BICA-3-2022-09-08_N		Pelecorhyncidae	100	40		0.0001	
			·						

| 9/8/2022 1 RG_GHFF_BICA-3-2022-09-08_N RG_GHFF_BICA-3-2022-09-08_N 1/3 m² kick & sweep Psychodidae 100 400 1 0.0002 9/8/2022 3 RG_GHFF_BICA-3-2022-09-08_N 1/3 m² kick & sweep Psychodidae 100 400 1 0.0002 9/8/2022 RG_GHFF_BICA-3-2022-09-08_N 1/3 m² kick & sweep Pericoma 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-3-2022-09-09_N RG_GHFF_BICA-3-2022-09-09_N 1/3 m² kick & sweep Planariidae 100 400 1 0.0285 9/9/2022 SRG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Polycelis 100 400 1 0.0005 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N NRG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N NRG_GHFF_BICA-4-2022-09-09_N --------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9/8/2022 3 RG_GHFF_BICA-3-2022-09-08_N RG_GHFF_BICA-3-2022-09-09_N RG_GHFF_BICA-3-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Polycelis 100 400 1 9/9/2022 SRG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Polycelis 100 400 1 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0005 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0008 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006                                                                           |
| 9/9/2022 13 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Enchytraeidae 100 400 1 0.0005 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0008 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF |
| 9/9/2022 5 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 9/9/2022 35 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0008 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Lebertiidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 0.0001 9/9/2022 35 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0008 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006            |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchonidae 100 400 1 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-0 |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0001  9/9/2022 35 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sperchon 100 400 1 0.0089  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0003  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Elmidae 100 400 1 0.0002  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0006  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0026  9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Chloroperlidae 100 400 1 0.0026                                                                                                                                                                                                                                                                                                                                                                                                            |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022 |
| 9/9/2022 35 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-202 |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-0 |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022 |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Ephemerellidae 100 400 1 0.0002 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2 |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022 |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 0.0006 9/9/2022 4 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 immature 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Chloroperlidae 100 400 1 0.0026 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sweltsa 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 9/9/2022 4 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Paracapnia 100 400 1 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09- |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Capniidae 100 400 1 immature 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Chloroperlidae 100 400 1 0.0026 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m² kick & sweep Sweltsa 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Chloroperlidae 100 400 1 0.0026<br>9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Sweltsa 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Sweltsa 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| $0/0/2022$ 2 DC CHEE DICA 4.2022.00.00 N. DC CHEE DICA 4.2022.00.00 N. $1/2 \text{ m}^2 \text{ bigh} \text{ 8. current}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Chloroperlidae 100 400 1 immature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Leuctridae 100 400 1 0.0001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Leuctridae 100 400 1 immature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Nemouridae 100 400 1 0.0020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Zapada 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 9/9/2022 14 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Nemouridae 100 400 1 immature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Perlodidae 100 400 1 0.3072                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Isoperla 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 9/9/2022 10 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Megarcys 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Taeniopterygidae 100 400 1 0.0001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Taeniopterygidae 100 400 1 immature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Hydropsychidae 100 400 1 0.1955                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Parapsyche 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Limnephilidae 100 400 1 0.0003                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Limnephilidae 100 400 1 immature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Rhyacophilidae 100 400 1 0.0103                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9/9/2022 8 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Rhyacophila 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 9/9/2022 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Chironomidae 100 400 1 0.0204                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 9/9/2022 14 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Chironomidae 100 400 1 pupae                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Boreoheptagyia 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 9/9/2022 10 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Micropsectra 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 9/9/2022 13 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Pagastia 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Pseudodiamesa 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 9/9/2022 21 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Cricotopus/Orthocladius 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 9/9/2022 31 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Eukiefferiella 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9/9/2022 3 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Hydrobaenus 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 9/9/2022 1 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Limnophyes 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 9/9/2022 2 RG_GHFF_BICA-4-2022-09-09_N RG_GHFF_BICA-4-2022-09-09_N 1/3 m ² kick & sweep Tvetenia 100 400 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

survey date qua	antity	observ sample code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH TAXON NAME	% SAMPLED	MESH	POOLED REPS	MEASURED BIOMASS	OC COMMENTS
9/9/2022	,		RG GHFF BICA-4-2022-09-09 N		Empididae	100		100 1	<u> </u>	C
9/9/2022	16		RG_GHFF_BICA-4-2022-09-09_N		Chelifera/Metachela	100		100 1		•
9/9/2022			RG GHFF BICA-4-2022-09-09 N		Clinocera	100		100 1		
9/9/2022			RG GHFF BICA-4-2022-09-09 N		Empididae	100		100 1		pupae
9/9/2022	-		RG GHFF BICA-4-2022-09-09 N		Pelecorhyncidae	100		100 1		
9/9/2022	3		RG GHFF BICA-4-2022-09-09 N	' '	Glutops	100		100 1		
9/9/2022			RG GHFF BICA-4-2022-09-09 N		Psychodidae	100		100 1		}
9/9/2022	50		RG GHFF BICA-4-2022-09-09 N		Pericoma	100		100 1		•
9/9/2022			RG_GHFF_BICA-4-2022-09-09_N	' '	Pediciidae	100		100 1		l
9/9/2022	1		RG GHFF BICA-4-2022-09-09 N		Pedicia	100		100 1		
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Planariidae	100		100 1	0.0253	3
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Polycelis	100		100 1		
9/9/2022	17		RG GHFF BICA-5-2022-09-09 N		Enchytraeidae	100	) 4	100 1	0.0041	L
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Lebertiidae	100	) 4	100 1	0.0002	2
9/9/2022	1		RG_GHFF_BICA-5-2022-09-09_N		Lebertia	100		100 1		
9/9/2022			RG GHFF BICA-5-2022-09-09 N		Sperchonidae	100	) 4	100 1	0.0002	2
9/9/2022	1		RG_GHFF_BICA-5-2022-09-09_N		Sperchon	100	) 4	100 1		
9/9/2022			RG GHFF BICA-5-2022-09-09 N		Ostracoda	100	) 4	100 1	0.0043	3
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Ephemerellidae	100	) 4	100 1	0.0005	5
9/9/2022	6		RG_GHFF_BICA-5-2022-09-09_N		Ephemerellidae	100	) 4	100 1		immature
9/9/2022			RG GHFF BICA-5-2022-09-09 N		Heptageniidae	100	) 4	100 1	0.0005	,
9/9/2022	2	RG GHFF BICA-5-2022-09-09 N	RG GHFF BICA-5-2022-09-09 N	1/3 m ² kick & sweep	Cinygmula	100	) 4	100 1		
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Capniidae	100	) 4	100 1	0.0001	L
9/9/2022	1	RG GHFF BICA-5-2022-09-09 N	RG GHFF BICA-5-2022-09-09 N	1/3 m ² kick & sweep	Capniidae	100	) 4	100 1		immature
9/9/2022		RG GHFF BICA-5-2022-09-09 N	RG GHFF BICA-5-2022-09-09 N	1/3 m ² kick & sweep	Chloroperlidae	100	) 4	100 1	0.0005	,
9/9/2022	2	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	100	) 4	100 1		immature
9/9/2022		RG GHFF BICA-5-2022-09-09 N	RG GHFF BICA-5-2022-09-09 N	1/3 m ² kick & sweep	Nemouridae	100	) 4	100 1	0.0113	3
9/9/2022	g	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Zapada	100	) 4	100 1		
9/9/2022	33	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	100	) 4	100 1		immature
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Perlodidae	100	) 4	100 1	0.0456	j
9/9/2022	15	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Isoperla	100	) 4	100 1		
9/9/2022	1	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Megarcys	100	) 4	100 1		
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Taeniopterygidae	100	) 4	100 1	0.0024	ŀ
9/9/2022	g	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Taeniopterygidae	100	) 4	100 1		immature
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Limnephilidae	100	) 4	100 1	0.0004	ŀ
9/9/2022	4	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Limnephilidae	100	) 4	100 1		immature
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Rhyacophilidae	100	) 4	100 1	0.0094	ŀ
9/9/2022	$\epsilon$	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Rhyacophila	100	) 4	100 1		
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	100	) 4	100 1	0.0811	L
9/9/2022	65	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	100	) 4	100 1		pupae
9/9/2022	2	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Micropsectra	100	) 4	100 1		
9/9/2022	104	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Pagastia	100	) 4	100 1		
9/9/2022	22	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	100	) 4	100 1		
9/9/2022	126	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Eukiefferiella	100	) 4	100 1		
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Tvetenia	100	) 4	100 1		
9/9/2022		RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Empididae	100	) 4	100 1	0.0349	)
9/9/2022			RG_GHFF_BICA-5-2022-09-09_N		Chelifera/Metachela	100	) 4	100 1		
9/9/2022	4	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Empididae	100	) 4	100 1		pupae

survey date quantit	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/9/2022	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Psychodidae	100	40	00	1 0.0024	1
9/9/2022	22 RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Pericoma	100	40	00	1	
9/9/2022	RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Pediciidae	100	40	00	1 0.0001	1
9/9/2022	1 RG_GHFF_BICA-5-2022-09-09_N	RG_GHFF_BICA-5-2022-09-09_N	1/3 m ² kick & sweep	Dicranota	100	40	00	1	
9/9/2022	2 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Nematoda	25	40	00	1 0.0001	1
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Planariidae	25	40	00	1 0.0017	7
9/9/2022	2 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Polycelis	25	40	00	1	
9/9/2022	9 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Enchytraeidae	25	40	00	1 0.0017	7
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Lebertiidae	25	40	00	1 0.0002	2
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Lebertia	25	40	00	1	
9/9/2022	4 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Ostracoda	25	40	00	1 0.0006	5
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Elmidae	25	40	00	1 0.0002	2
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Elmidae	25	40	0	1	immature
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Capniidae	25	40	00	1 0.0004	1
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Paracapnia	25	40	0	1	
9/9/2022	3 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Capniidae	25	40	00	1	immature
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	25	40	00	1 0.0002	2
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Chloroperlidae	25	40	00	1	immature
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	25	40	00	1 0.0054	1
9/9/2022	5 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Zapada	25	40	00	1	
9/9/2022	14 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Nemouridae	25	40	00	1	immature
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Perlodidae	25	40	00	1 0.0668	3
9/9/2022	12 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Isoperla	25	40	00	1	
9/9/2022	3 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Megarcys	25	40	00	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Perlodidae	100	40	00	1 0.0895	5
9/9/2022	4 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Megarcys	100	40	00	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Taeniopterygidae	25	40	00	1 0.0004	1
9/9/2022	6 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Taeniopterygidae	25	40	00	1	immature
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Rhyacophilidae	25	40	00	1 0.0287	7
9/9/2022	4 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Rhyacophila	25	40	0	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	25	40	00	1 0.0760	)
9/9/2022	40 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Chironomidae	25	40	00	1	pupae
9/9/2022	18 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Micropsectra	25	40	00	1	
9/9/2022	2 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Tanytarsus	25	40	00	1	
9/9/2022	.08 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Pagastia	25	40	0	1	
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Pseudodiamesa	25	40	0	1	
9/9/2022	32 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	25	40	00	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Diplocladius	25	40	00	1	
9/9/2022	73 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Eukiefferiella	25	40	0	1	
9/9/2022	2 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Hydrobaenus	25	40	0	1	
9/9/2022	32 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Tvetenia	25	40	00	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Empididae	25	40	00	1 0.0418	3
9/9/2022	34 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Chelifera/Metachela	25	40	00	1	
9/9/2022	4 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Empididae	25	40	00	1	pupae
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Pelecorhyncidae	25	40	00	1 0.0006	5
9/9/2022	1 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Glutops	25	40	00	1	
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Psychodidae	25	40	00	1 0.0022	2
9/9/2022	24 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Pericoma	25	40	00	1	

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMAS	SS QC_COMMENTS
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Pediciidae	25	40	0 1	. 0.0	020
9/9/2022	RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Antocha	25	40	0 1	1	
9/9/2022	5 RG_GHFF_BICA-6-2022-09-09_N	RG_GHFF_BICA-6-2022-09-09_N	1/3 m ² kick & sweep	Dicranota	25	40	0 1	<u>.</u>	
9/15/2022	RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Planariidae	25	40	0 1	0.0	044
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Polycelis	25	40	0 1	1	
9/15/2022	RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Planariidae	6.25	40	0 1	0.0	070
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Polycelis	6.25	40	0 1	_	
9/15/2022	12 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Enchytraeidae	25	40	0 1	0.0	010
9/15/2022	12 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Enchytraeidae	6.25	40	0 1	0.0	010
9/15/2022	RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Lebertiidae	25	40	0 1	0.0	0001
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Lebertia	25	40	0 1	_	
9/15/2022	8 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Ostracoda	25	40	0 1	0.0	017
9/15/2022	RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Capniidae	6.25	40	0 1	0.0	010
9/15/2022	3 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Capniidae	6.25	40	0 1	_	immature
9/15/2022	RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Capniidae	25	40	0 1	0.0	018
9/15/2022	3 RG_GHUT_BICA-1-2022-09-15_N	RG_GHUT_BICA-1-2022-09-15_N	1/3 m ² kick & sweep	Paracapnia	25	40	0 1	_	
9/15/2022	23 RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Capniidae	25	40	0 1		immature
9/15/2022	RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Nemouridae	25	40	0 1	0.0	0001
9/15/2022	3 RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Nemouridae	25	40	0 1		immature
9/15/2022	RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Peltoperlidae	25	40	0 1	0.0	0001
9/15/2022	2 RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Yoraperla	25	40	0 1		
9/15/2022	RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Perlodidae	25	40	0 1	0.0	0001
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Isoperla	25	40	0 1		
9/15/2022		RG GHUT BICA-1-2022-09-15 N	· ·	Taeniopterygidae	25	40	0 1	0.0	0001
9/15/2022	1 RG GHUT BICA-1-2022-09-15 N		· ·	Taeniopterygidae	25	40	0 1		immature
9/15/2022		RG_GHUT_BICA-1-2022-09-15_N		Ceratopogonidae	25	40	0 1	0.0	0001
9/15/2022	1 RG GHUT BICA-1-2022-09-15 N		· ·	Probezzia	25	40	0 1		
9/15/2022		RG GHUT BICA-1-2022-09-15 N	· ·	Chironomidae	6.25	40	0 1	0.0	079
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N			Chironomidae	6.25	40	0 1		pupae
9/15/2022	1 RG_GHUT_BICA-1-2022-09-15_N			Pagastia	6.25	40	0 1		P - P
9/15/2022	2 RG GHUT BICA-1-2022-09-15 N		· ·	Pseudodiamesa	6.25	40	0 1		
9/15/2022	2 RG_GHUT_BICA-1-2022-09-15_N			Cricotopus/Orthocladius	6.25	40	0 1		
9/15/2022	6 RG_GHUT_BICA-1-2022-09-15_N			Eukiefferiella	6.25	40	0 1		
9/15/2022		RG GHUT BICA-1-2022-09-15 N	· ·	Chironomidae	25	40	0 1	0.0	519
	11 RG GHUT BICA-1-2022-09-15 N			Chironomidae	25	40	0 1		pupae
	26 RG_GHUT_BICA-1-2022-09-15_N			Pagastia	25	40	0 1		P - P
9/15/2022	2 RG GHUT BICA-1-2022-09-15 N		· ·	Pseudodiamesa	25	40	0 1		
9/15/2022	1 RG GHUT BICA-1-2022-09-15 N		· ·	Corynoneura	25	40	0 1		
9/15/2022	51 RG_GHUT_BICA-1-2022-09-15_N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	25	40	0 1		
	66 RG GHUT BICA-1-2022-09-15 N			Eukiefferiella	25	40	0 1		
	12 RG GHUT BICA-1-2022-09-15 N	RG GHUT BICA-1-2022-09-15 N	1/3 m ² kick & sweep	Hydrobaenus	25	40	0 1		
9/15/2022	4 RG_GHUT_BICA-1-2022-09-15_N			Tvetenia	25	40			
9/15/2022		RG_GHUT_BICA-1-2022-09-15_N		Empididae	25	40			007
9/15/2022	1 RG GHUT BICA-1-2022-09-15 N			Empididae	25	40			pupae
9/15/2022		RG_GHUT_BICA-1-2022-09-15_N		Psychodidae	6.25	40	-	='	0001
9/15/2022	1 RG GHUT BICA-1-2022-09-15 N			Pericoma	6.25	40			
9/15/2022		RG GHUT BICA-1-2022-09-15 N		Psychodidae	25	40			1003
9/15/2022	4 RG GHUT BICA-1-2022-09-15 N		· ·	Pericoma	25	40			
-, -,	_= = = = ==============================	_= = = = = == == == == == == == == == ==					-		

survey date quantity	observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Planariidae	25	400	1	0.0016	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Polycelis	25	400	1	1	
9/15/2022	3 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Enchytraeidae	25	400	1	0.0003	
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Naididae	100	400	1	0.0029	
9/15/2022	2 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Tubificinae	100	400	1	1	immature with hai
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Naididae	25	400	1	0.0020	
9/15/2022	2 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Tubificinae	25	400	1	1	immature with hai
9/15/2022	14 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Ostracoda	25	400	1	0.0034	
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Capniidae	25	400	1	0.0031	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Mesocapnia	25	400	1	_	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Paracapnia	25	400	1	_	
9/15/2022	4 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Capniidae	25	400	1	_	immature
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Chloroperlidae	25	400	1	0.0004	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Sweltsa	25	400	1	_	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Chloroperlidae	25	400	1	_	immature
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Peltoperlidae	25	400	1	0.0002	
9/15/2022	1 RG GHUT BICA-2 2022-09-	15 N RG GHUT BICA-2 2022-09-15	N 1/3 m ² kick & sweep	Yoraperla	25	400	1		
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Perlodidae	25	400	1	0.0111	
9/15/2022	3 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Isoperla	25	400	1	1	
9/15/2022	1 RG GHUT BICA-2 2022-09-	15 N RG GHUT BICA-2 2022-09-15	N 1/3 m ² kick & sweep	Megarcys	25	400	1		
9/15/2022	RG GHUT BICA-2 2022-09-	15 N RG GHUT BICA-2 2022-09-15	N 1/3 m ² kick & sweep	Taeniopterygidae	25	400	1	0.0001	
9/15/2022	2 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Taeniopterygidae	25	400	1	1	immature
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Chironomidae	100	400	1	0.0152	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Pseudodiamesa	100	400	1	1	
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Chironomidae	25	400	1	0.0308	
9/15/2022	4 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Chironomidae	25	400	1	1	pupae
9/15/2022	13 RG GHUT BICA-2 2022-09-	15 N RG GHUT BICA-2 2022-09-15	N 1/3 m ² kick & sweep	Pagastia	25	400	1		
9/15/2022	6 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Pseudodiamesa	25	400	1	1	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Brillia	25	400	1	1	
9/15/2022	9 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Cricotopus/Orthocladius	25	400	1	_	
9/15/2022	24 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Eukiefferiella	25	400	1	1	
9/15/2022	5 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Hydrobaenus	25	400	1	1	
9/15/2022	4 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Tvetenia	25	400	1	1	
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Empididae	25	400	1	0.0039	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Clinocera	25	400	1	1	
9/15/2022	1 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Empididae	25	400	1	1	pupae
9/15/2022	RG GHUT BICA-2 2022-09-	15 N RG GHUT BICA-2 2022-09-15	N 1/3 m ² kick & sweep	Psychodidae	25	400	1		
9/15/2022	6 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Pericoma	25	400	1	1	
9/15/2022	RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Pediciidae	25	400	1	0.0016	
9/15/2022	5 RG_GHUT_BICA-2_2022-09-	15_N RG_GHUT_BICA-2_2022-09-15_	N 1/3 m ² kick & sweep	Dicranota	25	400	1	1	
9/15/2022	RG GHUT BICA-3 2022-09-	15 N RG GHUT BICA-3 2022-09-15	N 1/3 m ² kick & sweep	Planariidae	100	400	1	0.0162	
9/15/2022	3 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Polycelis	100	400	1	1	
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Enchytraeidae	100	400	1	0.0011	
		 15_N RG_GHUT_BICA-3_2022-09-15_		Ostracoda	100	400	1	0.0130	
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Collembola	100	400	1	0.0008	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Capniidae	100	400	1	0.0175	
9/15/2022	8 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Mesocapnia	100	400	1		
9/15/2022	4 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-15_	N 1/3 m ² kick & sweep	Capniidae	100	400	1		immature

survey date quanti	cy observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED	MESH P	OOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Peltoperlidae	100	400	1	0.000	4
9/15/2022	2 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Yoraperla	100	400	1	l	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Perlodidae	100	400	1	0.007	7
9/15/2022	10 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Isoperla	100	400	1	L	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Limnephilidae	100	400	1	0.001	3
9/15/2022	9 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Limnephilidae	100	400	1	l	immature
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Rhyacophilidae	100	400	1	0.020	9
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Rhyacophila	100	400	1	L	pupae
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Chironomidae	100	400	1	0.049	3
9/15/2022	2 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Chironomidae	100	400	1	L	pupae
9/15/2022	9 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Pseudodiamesa	100	400	1	L	
9/15/2022	2 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Brillia	100	400	1	L	
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Eukiefferiella	100	400	1	L	
9/15/2022	17 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-1	L5_N 1/3 m ² kick & sweep	Hydrobaenus	100	400	1	L	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-1	L5_N 1/3 m ² kick & sweep	Empididae	100	400	1	0.004	6
9/15/2022	2 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Clinocera	100	400	1	L	
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Empididae	100	400	1	l	pupae
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Pelecorhyncidae	100	400	1	0.007	6
9/15/2022	1 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Glutops	100	400	1	l	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-:	L5_N 1/3 m ² kick & sweep	Psychodidae	100	400	1	0.005	0
9/15/2022	23 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Pericoma	100	400	1	l	
9/15/2022	RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Pediciidae	100	400	1	0.014	9
9/15/2022	8 RG_GHUT_BICA-3_2022-09-	15_N RG_GHUT_BICA-3_2022-09-2	L5_N 1/3 m ² kick & sweep	Dicranota	100	400	1	l	
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Planariidae	50	400	1	0.001	7
9/15/2022	2 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Polycelis	50	400	1	l	
9/15/2022	4 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-2	L5_N 1/3 m ² kick & sweep	Enchytraeidae	50	400	1	0.000	8
9/15/2022	7 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-2	L5_N 1/3 m ² kick & sweep	Ostracoda	50	400	1	0.002	2
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-2	L5_N 1/3 m ² kick & sweep	Elmidae	50	400	1	0.001	7
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-2	L5_N 1/3 m ² kick & sweep	Heterlimnius	50	400	1	l	
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Capniidae	50	400	1	0.003	5
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Mesocapnia	50	400	1	L	
9/15/2022	4 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Capniidae	50	400	1	L	immature
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Nemouridae	50	400	1	0.000	3
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Nemouridae	50	400	1	L	immature
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Perlodidae	50	400	1	0.003	6
9/15/2022	5 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-:	L5_N 1/3 m ² kick & sweep	Isoperla	50	400	1	L	
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Limnephilidae	50	400	1	0.000	1
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Limnephilidae	50	400	1	L	immature
9/15/2022	RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-:	L5_N 1/3 m ² kick & sweep	Chironomidae	50	400	1	0.032	0
9/15/2022	8 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-:	L5_N 1/3 m ² kick & sweep	Chironomidae	50	400	1	L	pupae
9/15/2022	6 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Pagastia	50	400	1	L	
9/15/2022	13 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-:	L5_N 1/3 m ² kick & sweep	Pseudodiamesa	50	400	1	L	
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-1	L5_N 1/3 m ² kick & sweep	Cricotopus/Orthocladius	50	400	1	L	
9/15/2022		15_N RG_GHUT_BICA-4_2022-09-:		Eukiefferiella	50	400	1	L	
9/15/2022		15_N RG_GHUT_BICA-4_2022-09-:		Hydrobaenus	50	400	1	L	
9/15/2022		15_N RG_GHUT_BICA-4_2022-09-:		Tvetenia	50	400	1	Ĺ	
9/15/2022		15_N RG_GHUT_BICA-4_2022-09-:		Empididae	50	400	1	0.003	3
9/15/2022	1 RG_GHUT_BICA-4_2022-09-	15_N RG_GHUT_BICA-4_2022-09-:	15_N 1/3 m ² kick & sweep	Chelifera/Metachela	50	400	1	L	

survey date	quantity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	%_SAMPLED MESH	POOLED_REPS	MEASURED_BIOMASS	QC_COMMENTS
9/15/2022	1 RG_GHUT_BICA-4_2022-09-15	_N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Clinocera	50	400	L	
9/15/2022	2 RG_GHUT_BICA-4_2022-09-15	N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Empididae	50	400	L	pupae
9/15/2022	RG_GHUT_BICA-4_2022-09-15	_N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Psychodidae	50	400	0.0046	5
9/15/2022	22 RG_GHUT_BICA-4_2022-09-15	_N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Pericoma	50	400	L	
9/15/2022	RG_GHUT_BICA-4_2022-09-15	_N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Pediciidae	50	400	0.0011	L
9/15/2022	3 RG_GHUT_BICA-4_2022-09-15	_N RG_GHUT_BICA-4_2022-09-15_N	1/3 m ² kick & sweep	Dicranota	50	400	L	
9/15/2022	4 RG_GHUT_BICA-5_2022-09-15	N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Enchytraeidae	25	400	0.0006	5
9/15/2022	4 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Ostracoda	25	400	0.0010	)
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Elmidae	25	400	0.0024	1
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Heterlimnius	25	400	L	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Capniidae	25	400	0.0081	L
9/15/2022	2 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Mesocapnia	25	400	L	
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Paracapnia	25	400	l	
9/15/2022	18 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Capniidae	25	400	L	immature
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Peltoperlidae	25	400	0.0018	3
9/15/2022	2 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Yoraperla	25	400	L	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Perlodidae	25	400	0.0154	1
9/15/2022	8 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Isoperla	25	400	L	
9/15/2022	2 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Megarcys	25	400	L	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Limnephilidae	25	400	0.0025	5
9/15/2022	11 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Limnephilidae	25	400	L	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Chironomidae	25	400	0.0394	1
9/15/2022	14 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Chironomidae	25	400	L	pupae
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Diamesa	25	400	L	
9/15/2022	10 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Pagastia	25	400	L	
9/15/2022	15 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Pseudodiamesa	25	400	l	
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Brillia	25	400	L	
9/15/2022	30 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Eukiefferiella	25	400	l	
9/15/2022	17 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Hydrobaenus	25	400	L	
9/15/2022	21 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Tvetenia	25	400	l	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Empididae	25	400	0.0085	5
9/15/2022	3 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Clinocera	25	400	L	
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Wiedemannia	25	400	l	
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Empididae	25	400	l	pupae
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Psychodidae	25	400	0.0105	5
9/15/2022	38 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Pericoma	25	400	L	
9/15/2022	RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Pediciidae	25	400	0.0002	2
9/15/2022	1 RG_GHUT_BICA-5_2022-09-15	_N RG_GHUT_BICA-5_2022-09-15_N	1/3 m ² kick & sweep	Dicranota	25	400	L	
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Nematoda	12.5	400	0.0001	L
9/15/2022	RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Planariidae	12.5	400	L 0.0091	L
9/15/2022	3 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Polycelis	12.5	400	L	
9/15/2022	3 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Enchytraeidae	12.5	400	0.0005	5
9/15/2022	13 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Ostracoda	12.5	400	0.0039	)
9/15/2022	RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Elmidae	12.5	400	0.0003	3
9/15/2022	2 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Elmidae	12.5	400	L	immature
9/15/2022		_N RG_GHUT_BICA-6_2022-09-15_N		Capniidae	12.5	400	0.0281	L
9/15/2022		_N RG_GHUT_BICA-6_2022-09-15_N		Mesocapnia	12.5	400		
9/15/2022	3 RG_GHUT_BICA-6_2022-09-15	_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Paracapnia	12.5	400	l	

<u>survey date</u> quantit	y observ_sample_code	LAB SAMPLE ID	BIC SAMPLE METHOD	BENCH TAXON NAME	% SAMPLED	MESH	POOLED REPS	MEASURED BIOMASS	QC COMMENTS
9/15/2022			1/3 m ² kick & sweep	Capniidae	12.5	400	_ 1	_	. –
9/15/2022				Leuctridae	12.5	400	1	0.0001	
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Leuctridae	12.5	400	1		
9/15/2022	RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Nemouridae	12.5	400	1	0.0086	
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Zapada	12.5	400	1		
9/15/2022	5 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Nemouridae	12.5	400	1		immature
9/15/2022	RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Peltoperlidae	12.5	400	1	0.0018	
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Yoraperla	12.5	400	1		
9/15/2022	RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Perlodidae	12.5	400	1	0.0184	
9/15/2022	12 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Isoperla	12.5	400	1		
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Megarcys	12.5	400	1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Limnephilidae	12.5	400	1	0.0019	
9/15/2022	7 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Limnephilidae	12.5	400	1		immature
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N	_	Chironomidae	12.5		1	0.0718	
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Chironomidae	12.5	400	1		pupae
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Micropsectra	12.5	400	1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Diamesa	12.5	400	1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Pagastia	12.5		1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Pseudodiamesa	12.5		1		
9/15/2022	17 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m ² kick & sweep	Cricotopus/Orthocladius	12.5	400	1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Eukiefferiella	12.5		_		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Hydrobaenus	12.5		1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Tvetenia	12.5		1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Empididae	12.5		_	0.0064	
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Empididae	12.5		_		pupae
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N	_	Psychodidae	12.5		1	0.0070	
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N	_	Pericoma	12.5		1		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Pediciidae	12.5			0.0145	
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N		Dicranota	12.5		_		
9/15/2022		5_N RG_GHUT_BICA-6_2022-09-15_N	_	Tipulidae	12.5		1	0.0022	
9/15/2022	1 RG_GHUT_BICA-6_2022-09-15	5_N RG_GHUT_BICA-6_2022-09-15_N	1/3 m² kick & sweep	Tipula	12.5	400	1		

survey date	quantity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	PERCENT_SAMPLED	MESH	POOLED_REPS	AREA_PER_REP	MEASURED_BIOMASS	QC_COMMENTS
9/20/2022		RG_GHP_BICA-01-2022-09-19		Nematoda	25	500		0.0232	0.0001	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Naididae	25	500		0.0232	0.0027	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Tubificinae	25	500		0.0232		immature with hair chaetae
9/20/2022		RG_GHP_BICA-01-2022-09-19		Limnodrilus udekemianus	25	500		0.0232		minutare with rian chaetae
9/20/2022		RG_GHP_BICA-01-2022-09-19		Pionidae	25	500		0.0232	0.0002	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Pionidae	25	500		0.0232		indeterminate
				Ostracoda	25	500		0.0232	0.0123	mueterminate
9/20/2022		RG_GHP_BICA-01-2022-09-19								
9/20/2022		RG_GHP_BICA-01-2022-09-19		Gammaridae	25	500		0.0232	0.3423	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Gammarus lacustris	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Gammarus	25	500		0.0232	0.0440	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Hyalellidae	25	500		0.0232	0.0110	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Hyalella	25	500		0.0232	0.0000	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Haliplidae	25	500		0.0232	0.0003	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Haliplus	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Baetidae	25	500		0.0232	0.0050	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Callibaetis	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Coenagrionidae	25	500		0.0232	0.0002	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Coenagrionidae	25	500		0.0232		immature
9/20/2022		RG_GHP_BICA-01-2022-09-19		Chironomidae	25	500		0.0232	0.3133	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Chironomidae	25	500		0.0232		pupae
9/20/2022		RG_GHP_BICA-01-2022-09-19	Petite Ponar	Chironomidae	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19	Petite Ponar	Apedilum	25	500	5	0.0232		
9/20/2022	55 RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Chironomus	25	500	5	0.0232		
9/20/2022	3 RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Cryptochironomus	25	500	5	0.0232		
9/20/2022	1 RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Sergentia	25	500	5	0.0232		
9/20/2022	6 RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Stictochironomus	25	500	5	0.0232		
9/20/2022	RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Micropsectra	25	500	5	0.0232		
9/20/2022	RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Paratanytarsus	25	500	5	0.0232		
9/20/2022	RG_GHP_BICA-01-2022-09-19	RG_GHP_BICA-01-2022-09-19	Petite Ponar	Polypedilum	25	500	5	0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19	Petite Ponar	Tanytarsus	25	500	5	0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Diamesa	25	500	5	0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Pagastia	25	500	5	0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Psectrocladius	25	500	5	0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Ablabesmyia	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Procladius	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Planorbidae	25	500		0.0232	0.0075	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Gyraulus	25	500		0.0232		
9/20/2022		RG_GHP_BICA-01-2022-09-19		Pisidiidae	25	500		0.0232	0.1677	
9/20/2022		RG_GHP_BICA-01-2022-09-19		Pisidium (Cyclocalyx)	25	500		0.0232		
9/19/2022		RG_GHP_BICA-02-2022-09-19		Ostracoda	12.5	500		0.0232	0.0094	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Gammaridae	12.5			0.0232	0.0544	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Gammarus lacustris	12.5			0.0232	0.00	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Gammarus	12.5	500		0.0232		
9/19/2022		RG_GHP_BICA-02-2022-09-19		Hyalellidae	12.5			0.0232	0.0169	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Hyalella	12.5	500		0.0232	0.0103	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Baetidae	12.5	500		0.0232	0.0002	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Callibaetis	12.5			0.0232	0.0002	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Coenagrionidae	12.5			0.0232	0.0018	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Coenagrionidae	12.5	500		0.0232		immature
9/19/2022		RG_GHP_BICA-02-2022-09-19		Chironomidae	12.5	500		0.0232	0.0271	minacarc
9/19/2022		RG_GHP_BICA-02-2022-09-19		Chironomus	12.5			0.0232	0.02/1	
9/19/2022		RG_GHP_BICA-02-2022-09-19		Cryptochironomus	12.5			0.0232		
9/19/2022		RG_GHP_BICA-02-2022-09-19		Stictochironomus	12.5	500		0.0232		
					12.5			0.0232		
9/19/2022		RG_GHP_BICA-02-2022-09-19		Paratanytarsus						
9/19/2022		RG_GHP_BICA-02-2022-09-19		Psectrocladius Ablabosmuia	12.5			0.0232		
9/19/2022		RG_GHP_BICA-02-2022-09-19		Ablabesmyia	12.5	500		0.0232 0.0232		
9/19/2022	3 RG_GHP_BICA-02-2022-09-19	RG_GHP_BICA-02-2022-09-19	reute rollai	Procladius	12.5	500	5	0.0232		

	quantity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD		PERCENT_SAMPLED MES		OLED_REPS	AREA_PER_REP	MEASURED_BIOMASS	QC_COMMENTS
9/19/2022	RG_GHP_BICA-02-2022-09-19	RG_GHP_BICA-02-2022-09-19	Petite Ponar	Planorbidae	12.5	500	5	0.023	32 0.0417	
9/19/2022	51 RG_GHP_BICA-02-2022-09-19	RG_GHP_BICA-02-2022-09-19	Petite Ponar	Gyraulus	12.5	500	5	0.023	32	
9/19/2022	RG_GHP_BICA-02-2022-09-19	RG_GHP_BICA-02-2022-09-19	Petite Ponar	Pisidiidae	12.5	500	5	0.023	32 0.3271	
9/19/2022	138 RG_GHP_BICA-02-2022-09-19	RG_GHP_BICA-02-2022-09-19	Petite Ponar	Pisidium (Cyclocalyx)	12.5	500	5	0.023	32	
9/19/2022		RG_GHP_BICA-03-2022-09-19	Petite Ponar	Ostracoda	50	500	5	0.023	0.0466	
9/19/2022		RG_GHP_BICA-03-2022-09-19		Gammaridae	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Gammarus lacustris	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Chaoboridae	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Chaoborus flavicans	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Chironomidae	50	500	5	0.023		
9/19/2022		RG GHP BICA-03-2022-09-19		Chironomus	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Cryptochironomus	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Tanytarsus	50	500	5	0.023		
				Procladius						
9/19/2022		RG_GHP_BICA-03-2022-09-19			50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Pisidiidae	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-03-2022-09-19		Pisidium (Cyclocalyx)	50	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Ostracoda	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gammaridae	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gammaridae	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gammarus lacustris	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gammarus lacustris	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gammarus	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19	Petite Ponar	Hyalellidae	25	500	5	0.023		
9/19/2022	1 RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Hyalella	25	500	5	0.023	32	
9/19/2022	RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Baetidae	25	500	5	0.023	0.0026	
9/19/2022	6 RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Callibaetis	25	500	5	0.023	32	
9/19/2022	RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Chironomidae	25	500	5	0.023	0.0687	
9/19/2022	1 RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Chironomidae	25	500	5	0.023	32	pupae
9/19/2022	13 RG_GHP_BICA-04-2022-09-19	RG_GHP_BICA-04-2022-09-19	Petite Ponar	Chironomus	25	500	5	0.023	32	
9/19/2022		RG_GHP_BICA-04-2022-09-19		Cryptochironomus	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Stictochironomus	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Tanytarsus	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Psectrocladius	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Ablabesmyia	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Procladius	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Planorbidae	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Gyraulus	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Pisidiidae	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-04-2022-09-19		Pisidium (Cyclocalyx)	25	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Nematoda	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Ostracoda	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Gammaridae	100	500	5	0.023		
							5			
9/19/2022		RG_GHP_BICA-05-2022-09-20		Gammarus lacustris	100	500		0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Chaoboridae	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Chaoborus flavicans	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Chironomidae	100	500	5	0.023	_	
9/19/2022		RG_GHP_BICA-05-2022-09-20		Chironomidae	100	500	5	0.023		pupae
9/19/2022		RG_GHP_BICA-05-2022-09-20		Chironomus	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Cryptochironomus	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Tanytarsus	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Procladius	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Planorbidae	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Gyraulus	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20		Pisidiidae	100	500	5	0.023		
9/19/2022		RG_GHP_BICA-05-2022-09-20	Petite Ponar	Pisidium (Cyclocalyx)	100	500	5	0.023		
9/20/2022		RG_GHP_BICA-06-2022-09-20		Ostracoda	100	500	5	0.023		
9/20/2022	RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Gammaridae	100	500	5	0.023	32 0.0366	

survey date quant	tity observ_sample_code	LAB_SAMPLE_ID	BIC_SAMPLE_METHOD	BENCH_TAXON_NAME	PERCENT_SAMPLED	MESH	POOLED_REPS	AREA_PER_REP	MEASURED_BIOMASS QC_COMMENTS
9/20/2022	3 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Gammarus lacustris	100	500	5	0.0232	
9/20/2022	RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Phryganeidae	100	500	5	0.0232	0.0183
9/20/2022	1 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Phryganea	100	500	5	0.0232	
9/20/2022	RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Chaoboridae	100	500	5	0.0232	0.0644
9/20/2022	17 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Chaoborus flavicans	100	500	5	0.0232	
9/20/2022	RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Chironomidae	100	500	5	0.0232	0.3067
9/20/2022	4 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Chironomidae	100	500	5	0.0232	pupae
9/20/2022	51 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Chironomus	100	500	5	0.0232	
9/20/2022	24 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Cryptochironomus	100	500	5	0.0232	
9/20/2022	111 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Tanytarsus	100	500	5	0.0232	
9/20/2022	1 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Ablabesmyia	100	500	5	0.0232	
9/20/2022	113 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Procladius	100	500	5	0.0232	
9/20/2022	RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Pisidiidae	100	500	5	0.0232	2.3928
9/20/2022	541 RG_GHP_BICA-06-2022-09-20	RG_GHP_BICA-06-2022-09-20	Petite Ponar	Pisidium (Cyclocalyx)	100	500	5	0.0232	

# TRICHANALYTICS - BENTHIC INVERTEBRATE TISSUE



### Trich Analytics Inc.

### Tissue Microchemistry Analysis Report

Client: Amy Wiebe

Aquatic Scientist

Minnow Environmental

Phone: (250) 595-1627

Email: awiebe@minnow.ca

Client Project: GGCAMP (22-16)

Analytical Request: Composite-Taxa Benthic Invertebrate Tissues (total metals and moisture) - 4 samples.

See chain of custody form provided for sample identification numbers.

#### Notes:

Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg)
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.
Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 110%.

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio

Data

16 Mar 2022

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TrichAnalytics Inc. 207-1753 Sean Heights Saanichton, BC V8M 0B3 www.trichanalytics.com



Date Received:

Project No.:

Method No.:

Date of Analysis:

Final Report Date:

10 Mar 2022

15 Mar 2022

16 Mar 2022

MET-002.05

2022-315

### Teck Resources Tissue Analysis Results

		Client ID	RG_GHBP_INV- 01_2022-02-28	RG_GHBP_INV- 03_2022-02-28	RG_GHBP_INV- 05_2022-02-28	RG_GHBP_INVLU M-05_2022-02-
		CIICITE	01_2022 02 20	03_2022 02 20	05_2022 02 20	28
		Lab ID	046	047	048	049
	We	et Weight (g)	0.3347	0.5297	0.3272	0.1842
		ry Weight (g)	0.0543	0.0759	0.0558	0.0310
		Moisture (%)	83.8	85.7	82.9	83.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.002	0.007	2.6	1.0	0.731	2.8
11B	0.060	0.200	6.9	3.2	1.8	7.9
23Na	1.1	3.7	5,111	5,014	3,920	2,909
24Mg	0.015	0.050	2,763	2,453	2,168	1,672
27Al	0.022	0.073	6,600	1,737	1,199	10,483
31P	39	130	12,342	12,250	12,728	12,041
39K	1.2	4.0	10,870	8,693	9,410	10,735
44Ca	14	47	26,453	28,068	6,252	7,302
49Ti	0.125	0.417	478	95	66	690
51V	0.028	0.093	7.8	2.2	1.3	10
52Cr	0.376	1.3	19	6.9	2.4	25
55Mn	0.009	0.030	109	100	91	69
57Fe	0.454	1.5	1,470	448	247	2,325
59Co	0.004	0.013	1.7	0.815	0.568	4.8
60Ni	0.038	0.127	43	26	13	51
63Cu	0.004	0.013	27	24	19	13
66Zn	0.353	1.2	165	163	152	156
75As	0.366	1.2	1.2	0.814	0.458	8.9
77Se	0.431	1.4	23	27	21	248
88Sr	0.001	0.003	32	29	8.4	11
95Mo	0.001	0.003	0.487	0.442	0.261	0.902
107Ag	0.001	0.003	0.257	0.238	0.104	0.479
111Cd	0.048	0.160	0.654	0.606	0.510	11
118Sn	0.018	0.060	0.957	0.735	0.538	1.6
121Sb	0.047	0.157	0.122	0.091	0.061	0.292
137Ba	0.001	0.003	124	69	38	112
202Hg	0.023	0.077	0.098	0.101	0.098	0.624
205TI	0.001	0.003	0.148	0.057	0.047	0.261
208Pb	0.002	0.007	1.2	0.589	0.425	1.6
238U	0.001	0.003	0.359	0.232	0.121	0.529

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

### Teck Resources Tissue QA/QC Relative Percent Difference Results

(	Client ID	D RG_GHBP_INV-01_2022-02-28						
	Lab ID		046					
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)				
7Li	0.002	2.6	2.3	12				
11B	0.060	6.9	5.8	17				
23Na	1.1	5,111	5,155	0.9				
24Mg	0.015	2,763	2,550	8.0				
27Al	0.022	6,600	4,730	33				
31P	39	12,342	11,586	6.3				
39K	1.2	10,870	11,044	1.6				
44Ca	14	26,453	34,428	26				
49Ti	0.125	478	360	28				
51V	0.028	7.8	7.0	11				
52Cr	0.376	19	19	0.0				
55Mn	0.009	109	114	4.5				
57Fe	0.454	1,470	1,516	3.1				
59Co	0.004	1.7	1.6	6.1				
60Ni	0.038	43	47	8.9				
63Cu	0.004	27	31	14				
66Zn	0.353	165	142	15				
75As	0.366	1.2	0.992	-				
77Se	0.431	23	21	9.1				
88Sr	0.001	32	30	6.5				
95Mo	0.001	0.487	0.541	11				
107Ag	0.001	0.257	0.245	4.8				
111Cd	0.048	0.654	0.694	5.9				
118Sn	0.018	0.957	0.754	24				
121Sb	0.047	0.122	0.121	-				
137Ba	0.001	124	89	33				
202Hg	0.023	0.098	0.092	-				
205Tl	0.001	0.148	0.124	18				
208Pb	0.002	1.2	1.2	0.0				
238U	0.001	0.359	0.393	9.0				

#### Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

#### Data Quality Objectives:

Laboratory Duplicates - RPD  $\leq$ 40% for all elements, except Ca and Sr, which are  $\leq$ 60% Minimum DQOs apply to individual samples at concentrations above 10x DL

### Teck Resources Tissue QA/QC Accuracy and Precision Results

Sample Group ID	01

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.002	1.21	1.3	104	7.1
11B	0.060	4.5	5.1	113	4.2
23Na	1.1	14,000	15,321	109	2.7
24Mg	0.015	910	1,053	116	4.5
27AI	0.022	197.2	225	114	10
31P	39	8,000	9,143	114	4.3
39K	1.2	15,500	17,293	112	3.9
44Ca	14	2,360	2,702	114	3.2
49Ti	0.125	12.24	14	118	15
51V	0.028	1.57	1.8	113	13
52Cr	0.376	1.87	2.2	116	6.2
55Mn	0.009	3.17	3.9	123	4.8
57Fe	0.454	343	403	118	4.6
59Co	0.004	0.25	0.300	120	5.6
60Ni	0.038	1.34	1.6	122	3.3
63Cu	0.004	15.7	19	121	5.3
66Zn	0.353	51.6	62	120	7.3
75As	0.366	6.87	7.8	113	3.7
77Se	0.431	3.45	3.8	110	0.0
88Sr	0.001	10.1	12	115	4.7
95Mo	0.001	0.29	0.321	111	5.0
107Ag	0.001	0.0252	0.030	118	6.0
111Cd	0.048	0.299	0.371	124	6.4
118Sn	0.018	0.061	0.066	109	6.5
121Sb	0.047	0.011	0.010	91	14
137Ba	0.001	8.6	9.1	106	5.7
202Hg	0.023	0.412	0.468	114	8.6
205Tl	0.001	0.0013	-	-	-
208Pb	0.002	0.404	0.427	106	8.4
238U	0.001	0.05	0.054	108	16

#### Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

#### Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

TI certified concentration from NIST-2976.

Accuracy and precision for TI are not reported as the certified concentration is too close to the reportable detection limit.

## Teck Resources Sample Group Information

Sample	Client ID	Lab ID	Date of
Sample Group ID 01	Client ID  RG_GHBP_INV-01_2022-02-28 RG_GHBP_INV-03_2022-02-28 RG_GHBP_INV-05_2022-02-28 RG_GHBP_INVLUM-05_2022-02-28	046 047 048 049	Date of Analysis 15 Mar 2022

Page 5 of 6

207-1753 Se	h A n a l y t i c s l n c. an Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084	Chain of Custody (COC) for LA-ICP-MS Analysis										
	Invoicing		Reporting (if different from Invoicing)									
Project Numbe	r: GGCAMP (22-16) (PO 748530)	ing the second										
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental									
Contact Name:	Giovanna Diaz	Contact Name:	Amy Wiebe									
Address:	421 Pine Avenue	Address:	2 Lamb Street									
City, Province:	Sparwood, BC	City, Province:	Georgetown, ON									
Postal Code:	V0B 2G0	Postal Code:	L7G 2G7									
Phone:	250-425-8202	Phone:	250-595-1627									
Email:	mike.pope@teck.com	Email:	awiebe@minnow.ca									
		Sample Analysis Re										
	Sample Identification:		Sample Type:									
1 rica il		Species	Sample type									
	RG_GHBP_INV-01_2022-02-28	Composite	Composite-taxa benthic invertebrate tissue samples									
	RG_GHBP_INV-03_2022-02-28	Composite	Composite-taxa benthic invertebrate tissue samples									
	RG_GHBP_INV-05_2022-02-28	Composite	Composite-taxa benthic invertebrate tissue samples									
049 4	RG_GHBP_INVI.UM-05_2022-02-28	Composite	Composite-taxa benthic invertebrate tissue samples									
5		Composite	Composite-taxa benthic invertebrate tissue samples									
6		Composite	Composite-taxa benthic invertebrate tissue samples									
7		Composite	Composite-taxa benthic invertebrate tissue samples									
8		Composite	Composite-taxa benthic invertebrate tissue samples									
. 9		Composite	Composite-taxa benthic invertebrate tissue samples									
10		Composite	Composite-taxa benthic invertebrate tissue samples									
11		Composite	· Composite-taxa benthic invertebrate tissue samples									
12		Composite	Composite-taxa benthic invertebrate tissue samples									
13		Composite	Composite-taxa benthic invertebrate tissue samples									
14		Composite	Composite-taxa benthic invertebrate tissue samples									
15		Composite	Composite-taxa benthic invertebrate tissue samples									
16		Composite	Composite-taxa benthic invertebrate tissue samples									
17		Composite	Composite-taxa benthic invertebrate tissue samples									
18		Composite	Composite-laxa benthic invertebrate tissue samples									
19		Composite	Composite-taxa benthic invertebrate tissue samples									
20		Composite	Composite-taxa benthic invertebrate tissue samples									
ample(s) Release	ed By: Maddy Stokes	Sample(s) Received	By: Elliot Howell									
ignature:		Signature:										
Date Sent:	10-Mar-22	ar-22 Date Received: 11 Mar 2022 (Proj # 2022-315)										
ample(s) Returne		Shipping Conditions:										
		Shipping Container:										
Signature:		Date Sent;										
and the second												



### Trich Analytics Inc.

#### Tissue Microchemistry Analysis Report

Client: Giovanna Diaz Date Received: 20 Sep 2022

Project Manager Date of Analysis: 26 Sep 2022

Teck Coal Limited 27 Sep 2022

**Phone:** (250) 865-3048 Final Report Date: 06 Oct 2022

Email: lisa.bowron@minnow.ca; awiebe@minnow.ca; giovanna.diaz@teck.com Project No.: 2022-398

aquascilab@teck.com; teck.lab.results@teck.com; Method No.: MET-002.06

teckcoal@equisonline.com

Client Project: REP_LAEMP_GC_2022-09 Regional Effects Program (PO 818999)

Analytical Request: Composite Benthic Invertebrate Tissue Microchemistry (total metals & moisture) - 23 samples.

See chain of custody form provided for sample identification numbers.

#### Notes:

Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg).

Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.

Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.

RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.

Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 96% (ranging from 94-97%).

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio

06 Oct 2022

Date

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Project No: 2022-398

		Client ID	RG_GANF_INV- 1_2022-09-13_N	RG_GANF_INV- 3_2022-09-13_N	RG_GANF_INV- 5_2022-09-13_N	RG_GAUT_INV- 1_2022-09-14_N	RG_GAUT_INV- 3_2022-09-14_N
		Lab ID	174	175	176	177	178
	We	et Weight (g)	0.6012	0.3354	0.3324	0.2490	0.2395
		y Weight (g)	0.1345	0.0700	0.0822	0.0391	0.0542
		Moisture (%)	77.6	79.1	75.3	84.3	77.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.019	0.063	1.7	1.9	2.6	5.2	11
11B	0.060	0.200	3.1	3.0	3.8	13	23
23Na	5.7	19	3,245	3,983	2,465	3,655	4,131
24Mg	0.078	0.260	1,798	2,761	2,516	2,182	2,987
27Al	0.087	0.290	3,197	3,193	4,057	12,497	21,316
31P	88	293	9,093	11,555	8,285	9,035	10,073
39K	2.8	9.3	9,576	12,870	10,659	12,773	18,525
44Ca	ia 6.1 20		8,589	18,424	13,761	5,451	6,405
49Ti	0.001 0.003		608	208	338	914	1,682
51V	0.036 0.120		5.4	4.7	9.3	20	49
52Cr	0.036       0.120         0.061       0.203		13	17	18	70	241
55Mn	0.061 0.203 0.008 0.027		36	30	41	117	169
57Fe	0.061     0.203       0.008     0.027       0.801     2.7		883	1,098	1,388	3,941	9,639
59Co	0.014	0.047	0.670	0.815	1.5	2.9	13
60Ni	0.052	0.173	22	33	32	113	307
63Cu	0.018	0.060	16	16	19	25	35
66Zn	0.230	0.767	98	108	101	225	241
75As	0.431	1.4	< 0.431	0.741	0.860	1.5	3.1
77Se	0.579	1.9	2.9	2.2	2.7	7.3	5.8
88Sr	0.001	0.003	12	16	24	21	29
95Mo	0.001	0.003	0.448	0.211	0.395	1.7	1.1
107Ag	0.001	0.003	0.165	0.117	0.213	0.261	0.412
111Cd	0.070	0.233	0.307	0.284	0.331	3.1	1.6
118Sn	0.022	0.073	0.388	0.490	0.470	0.870	1.4
121Sb	0.004	0.013	0.113	0.123	0.134	0.379	0.759
137Ba	0.001	0.003	59	66	112	190	321
202Hg	0.022	0.073	0.069	0.064	0.075	0.237	0.173
205Tl	0.001	0.003	0.021	0.013	0.028	0.083	0.155
208Pb	0.001	0.003	0.772	0.551	0.705	2.2	5.4
238U	0.001	0.003	0.106	0.154	0.239	0.339	0.596

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

			RG_GAUT_INV-	RG_GHBP_INVOL	RG_GHBP_COMP	RG_GHBP_INV-	RG_GHBP_INVOL
		Client ID	5_2022-09-14_N	I-1_2022-09-	OLI-1_2022-09-	3_2022-09-12_N	I-5_2022-09-
				12_N	12_N		12_N
		Lab ID	179	180	181	182	183
	We	et Weight (g)	0.3593	0.2633	0.9351	1.0061	0.0663
	Dı	y Weight (g)	0.0670	0.0686	0.2031	0.1809	0.0210
		Moisture (%)	81.4	73.9	78.3	82.0	68.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.019	0.063	5.4	3.7	6.3	2.3	3.4
11B	0.060	0.200	11	8.5	13	2.2	7.2
23Na	5.7	19	3,096	2,599	2,535	4,665	2,813
24Mg	0.078	0.260	2,081	2,923	3,158	2,515	2,678
27Al	0.087	0.290	11,064	7,501	10,772	1,494	6,987
31P	88	293	10,654	8,666	8,694	11,912	9,523
39K	2.8	9.3	13,101	11,778	11,354	10,234	11,191
44Ca	6.1	20	4,114	10,506	20,645	22,831	19,057
49Ti	0.001	0.003	885	626	777	104	493
51V	0.036	0.120	24	13	19	2.8	13
52Cr	0.061	0.203	88	27	25	13	21
55Mn	0.008	0.027	127	87	104	66	104
57Fe	0.801	2.7	4,454	3,395	3,843	691	2,605
59Co	0.014	0.047	4.0	3.9	2.8	2.1	4.4
60Ni	0.052	0.173	124	73	61	29	62
63Cu	0.018	0.060	28	14	22	35	15
66Zn	0.230	0.767	257	247	178	171	180
75As	0.431	1.4	1.6	5.1	4.1	0.817	6.4
77Se	0.579	1.9	5.2	97	63	24	111
88Sr	0.001	0.003	18	15	30	26	19
95Mo	0.001	0.003	0.712	0.923	1.3	0.348	0.858
107Ag	0.001	0.003	0.268	0.179	0.316	0.314	0.262
111Cd	0.070	0.233	1.4	4.3	2.2	1.8	7.4
118Sn	0.022	0.073	0.886	0.510	0.606	0.294	0.942
121Sb	0.004	0.013	0.405	0.335	0.399	0.073	0.305
137Ba	0.001	0.003	192	125	196	76	139
202Hg	0.022	0.073	0.179	0.277	0.211	0.102	0.376
205Tl	0.001	0.003	0.081	0.086	0.105	0.073	0.283
208Pb	0.001	0.003	2.4	2.0	2.5	0.600	2.4
238U	0.001	0.003	0.309	0.470	0.760	0.141	0.426

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

			RG_GHBP_COMP	RG_GHDT_INV-	RG_GHDT_INV-	RG_GHDT_INV-	RG_GHFF_INV-
		Client ID	OLI-5_2022-09-	1_2022-09-16_N	3_2022-09-16_N	5_2022-09-16_N	1_2022-09-08_N
			12_N				
		Lab ID	184	185	186	187	188
	We	et Weight (g)	0.9756	0.5071	0.7129	0.6679	0.3606
	Dı	y Weight (g)	0.1841	0.1105	0.1387	0.1195	0.0727
		Moisture (%)	81.1	78.2	80.5	82.1	79.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.019	0.063	1.4	1.9	1.8	2.7	1.6
11B	0.060	0.200	1.3	3.3	2.6	4.5	3.0
23Na	5.7	19	4,537	4,582	5,149	5,169	3,837
24Mg	0.078	0.260	1,239	2,814	2,433	2,678	2,144
27Al	0.087	0.290	817	2,782	1,986	3,631	2,677
31P	88	293	8,950	14,709	15,294	14,584	12,280
39K	2.8	9.3	8,943	11,673	13,434	13,188	10,134
44Ca	6.1	20	11,965	16,241	16,204	20,817	24,230
49Ti	0.001	0.003	55	188	129	246	206
51V	0.036	0.120	1.4	4.8	4.0	6.9	5.6
52Cr	0.061	0.203	8.4	25	22	24	20
55Mn	0.008	0.027	33	55	49	62	36
57Fe	0.801	2.7	376	1,194	947	1,423	1,120
59Co	0.014	0.047	0.917	1.1	1.7	2.0	1.6
60Ni	0.052	0.173	16	65	54	61	46
63Cu	0.018	0.060	25	20	21	21	14
66Zn	0.230	0.767	120	168	179	153	92
75As	0.431	1.4	0.723	0.910	1.0	1.1	0.548
77Se	0.579	1.9	15	13	11	7.3	7.6
88Sr	0.001	0.003	12	10	9.7	13	16
95Mo	0.001	0.003	0.186	0.534	0.209	0.255	0.278
107Ag	0.001	0.003	0.134	0.148	0.140	0.198	0.157
111Cd	0.070	0.233	0.733	1.3	1.2	1.4	0.908
118Sn	0.022	0.073	0.201	0.621	0.363	0.875	1.5
121Sb	0.004	0.013	0.050	0.110	0.104	0.136	0.119
137Ba	0.001	0.003	33	55	45	69	76
202Hg	0.022	0.073	0.071	0.090	0.090	0.090	0.076
205TI	0.001	0.003	0.047	0.081	0.066	0.084	0.063
208Pb	0.001	0.003	0.334	0.905	0.745	1.3	1.4
238U	0.001	0.003	0.067	0.302	0.222	0.291	0.255

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

			RG_GHFF_INV-	RG_GHFF_INV-	RG_GHNF_INV-	RG_GHNF_INV-	RG_GHNF_INV-
		Client ID	3_2022-09-09_N		1_2022-09-09_N	3_2022-09-10_N	5_2022-09-10_N
		Lab ID	189	190	191	192	193
		et Weight (g)	0.3387	0.3683	0.0735	0.1888	0.2495
	Di	ry Weight (g)	0.0735	0.0671	0.0119	0.0304	0.0376
		Moisture (%)	78.3	81.8	83.8	83.9	84.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.019	0.063	1.3	1.7	0.931	1.7	2.6
11B	0.060	0.200	1.8	2.4	1.3	1.4	3.0
23Na	5.7	19	3,226	4,950	1,091	6,843	5,623
24Mg	0.078	0.260	1,745	2,912	1,323	2,608	2,768
27Al	0.087	0.290	1,950	1,957	1,692	1,337	3,922
31P	88	293	11,775	16,394	5,697	20,272	16,341
39K	2.8	9.3	9,140	13,932	3,384	15,082	14,037
44Ca	6.1	20	19,765	26,079	14,686	14,101	22,457
49Ti	0.001	0.003	126	153	110	81	257
51V	0.036	0.120	3.8	3.9	3.3	2.5	7.3
52Cr	0.061	0.203	13	26	15	22	25
55Mn	0.008	0.027	24	32	23	46	74
57Fe	0.801	2.7	826	999	645	735	1,313
59Co	0.014	0.047	1.1	1.1	1.1	1.0	2.1
60Ni	0.052	0.173	32	54	27	44	47
63Cu	0.018	0.060	16	23	7.5	24	14
66Zn	0.230	0.767	131	137	104	187	141
75As	0.431	1.4	< 0.431	0.630	0.630	0.560	1.2
77Se	0.579	1.9	6.4	8.7	4.4	9.5	7.8
88Sr	0.001	0.003	11	14	7.4	7.1	12
95Mo	0.001	0.003	0.186	0.487	0.116	0.464	0.325
107Ag	0.001	0.003	0.157	0.174	0.105	0.099	0.105
111Cd	0.070	0.233	2.2	0.838	1.0	2.4	5.0
118Sn	0.022	0.073	0.749	0.587	0.498	0.832	0.871
121Sb	0.004	0.013	0.103	0.112	0.095	0.085	0.139
137Ba	0.001	0.003	57	65	36	31	66
202Hg	0.022	0.073	0.080	0.080	0.052	0.111	0.062
205Tl	0.001	0.003	0.041	0.056	0.059	0.091	0.119
208Pb	0.001	0.003	0.796	0.774	0.559	0.614	1.3
238U	0.001	0.003	0.206	0.265	0.191	0.200	0.339

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

			RG_GHUT_INV-	RG_GHUT_INV-	RG_GHUT_INV-
		Client ID	1_2022-09-15_N	3_2022-09-15_N	5_2022-09-15_N
		Lab ID	194	195	196
		et Weight (g)	0.5133	0.4218	0.4737
		y Weight (g)	0.0859	0.0685	0.0784
		Moisture (%)	83.3	83.8	83.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)
7Li	0.019	0.063	2.5	2.8	2.6
11B	0.060	0.200	3.2	2.7	3.9
23Na	5.7	19	6,433	6,259	4,212
24Mg	0.078	0.260	2,310	2,432	2,725
27Al	0.087	0.290	4,068	3,984	5,446
31P	88	293	18,262	19,084	14,728
39K	2.8	9.3	15,492	12,728	11,504
44Ca	6.1	20	19,492	10,735	15,755
49Ti	0.001	0.003	312	286	376
51V	0.036	0.120 0.203	7.6 23	7.5 26	9.6
52Cr	0.061	28			
55Mn	0.008	0.027	63	75	62
57Fe	0.801	2.7	1,313	1,657	1,662
59Co	0.014	0.047	2.3	2.3	2.6
60Ni	0.052	0.173	48	49	52
63Cu	0.018	0.060	19	18	27
66Zn	0.230	0.767	191	195	216
75As	0.431	1.4	0.898	1.1	0.957
77Se	0.579	1.9	9.2	11	7.8
88Sr	0.001	0.003	11	9.3	12
95Mo	0.001	0.003	0.383	0.371	0.406
107Ag	0.001	0.003	0.067	0.105	0.093
111Cd	0.070	0.233	6.9	8.5	6.1
118Sn	0.022	0.073	0.548	0.626	1.0
121Sb	0.004	0.013	0.153	0.145	0.188
137Ba	0.001	0.003	63	53	71
202Hg	0.022	0.073	0.076	0.111	0.123
205TI	0.001	0.003	0.112	0.154	0.130
208Pb	0.001	0.003	1.5	1.4	1.8
238U	0.001	0.003	0.330	0.196	0.309

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

### Teck Coal Limited Tissue QA/QC Relative Percent Difference Results

	Ī	RG GHRP	_COMPOLI-1	2022-09-			1			
(	Client ID	NO_GIIDI	_eoivii oli i_ 12_N		RG GHDI	_INV-3_2022	2-09-16 N	RG GHUI	Γ_INV-5_2022	2-09-15 N
	Lab ID		181		KO_GIIDI	186	05 10_11	110_01101	196	. 05 15_11
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.019	6.3	5.5	14	1.8	2.2	20	2.6	2.7	3.8
11B	0.060	13	11	17	2.6	3.5	30	3.9	3.7	5.3
23Na	5.7	2,535	2,490	1.8	5,149	4,761	7.8	4,212	4,279	1.6
24Mg	0.078	3,158	2,481	24	2,433	2,616	7.2	2,725	2,683	1.6
27Al	0.087	10,772	8,715	21	1,986	2,950	39	5,446	5,903	8.1
31P	88	8,694	10,016	14	15,294	14,127	7.9	14,728	15,458	4.8
39K	2.8	11,354	10,289	9.8	13,434	12,570	6.6	11,504	11,652	1.3
44Ca	6.1	20,645	19,443	6.0	16,204	18,289	12	15,755	14,117	11
49Ti	0.001	777	632	21	129	134	3.8	376	340	10
51V	0.036	19	15	24	4.0	5.6	33	9.6	8.8	8.7
52Cr	0.061	25	20	22	22	22	0.0	28	26	7.4
55Mn	0.008	104	81	25	49	50	2.0	62	58	6.7
57Fe	0.801	3,843	2,816	31	947	1,351	35	1,662	1,632	1.8
59Co	0.014	2.8	2.3	20	1.7	1.8	5.7	2.6	2.5	3.9
60Ni	0.052	61	58	5.0	54	55	1.8	52	48	8.0
63Cu	0.018	22	23	4.4	21	19	10	27	24	12
66Zn	0.230	178	208	16	179	162	10	216	184	16
75As	0.431	4.1	4.2	-	1.0	1.0	-	0.957	1.1	-
77Se	0.579	63	68	7.6	11	11	0.0	7.8	8.2	5.0
88Sr	0.001	30	33	9.5	9.7	10	3.0	12	11	8.7
95Mo	0.001	1.3	1.1	17	0.209	0.232	10	0.406	0.394	3.0
107Ag	0.001	0.316	0.351	11	0.140	0.145	3.5	0.093	0.093	0.0
111Cd	0.070	2.2	2.1	4.7	1.2	1.2	0.0	6.1	6.1	0.0
118Sn	0.022	0.606	0.594	2.0	0.363	0.455	23	1.0	1.0	0.0
121Sb	0.004	0.399	0.281	35	0.104	0.120	14	0.188	0.182	3.2
137Ba	0.001	196	192	2.1	45	60	29	71	69	2.9
202Hg	0.022	0.211	0.254	-	0.090	0.090	-	0.123	0.118	-
205TI	0.001	0.105	0.097	7.9	0.066	0.083	23	0.130	0.152	16
208Pb	0.001	2.5	2.1	17	0.745	1.0	29	1.8	1.8	0.0
238U	0.001	0.760	0.517	38	0.222	0.310	33	0.309	0.313	1.3

#### Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

#### Data Quality Objectives:

Laboratory Duplicates - RPD  $\leq$ 40% for all elements, except Ca and Sr, which are  $\leq$ 60% Minimum DQOs apply to individual samples at concentrations above 10x DL

Project No: 2022-398

### Teck Coal Limited Tissue QA/QC Accuracy and Precision Results

	S	ample Group ID		01			02	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.019	1.21	1.2	98	7.1	1.2	99	8.3
11B	0.060	4.5	4.2	92	2.7	4.4	98	4.5
23Na	5.7	14,000	12,697	91	2.4	14,166	101	8.9
24Mg	0.078	910	837	92	3.1	919	101	8.0
27Al	0.087	197.2	164	83	5.9	209	106	2.4
31P	88	8,000	7,328	92	1.1	8,406	105	10
39K	2.8	15,500	14,336	92	2.9	15,204	98	8.4
44Ca	6.1	2,360	2,223	94	4.5	2,503	106	5.5
49Ti	0.001	12.24	10	83	16	13	105	12
51V	0.036	1.57	1.4	87	8.4	1.6	101	12
52Cr	0.061	1.87	1.7	90	5.0	1.9	102	6.4
55Mn	0.008	3.17	3.1	98	3.2	3.4	108	5.3
57Fe	0.801	343	332	97	4.2	357	104	5.8
59Co	0.014	0.25	0.225	90	8.4	0.267	107	8.3
60Ni	0.052	1.34	1.3	97	5.4	1.5	110	7.4
63Cu	0.018	15.7	15	97	2.9	17	106	9.1
66Zn	0.230	51.6	48	93	5.9	54	104	5.2
75As	0.431	6.87	6.4	94	3.0	6.8	98	7.7
77Se	0.579	3.45	3.3	97	3.5	3.2	94	11
88Sr	0.001	10.1	9.7	96	8.7	11	107	7.7
95Mo	0.001	0.29	0.300	104	4.7	0.302	104	5.5
107Ag	0.001	0.0252	0.023	93	14	0.029	115	17
111Cd	0.070	0.299	0.297	99	9.2	0.338	113	15
118Sn	0.022	0.061	0.062	102	13	0.056	92	20
121Sb	0.004	0.011	0.013	120	17	0.011	98	15
137Ba	0.001	8.6	6.8	79	5.7	8.5	99	5.5
202Hg	0.022	0.412	0.414	101	9.4	0.413	100	5.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.308	76	4.3	0.382	95	10
238U	0.001	0.05	0.041	82	3.2	0.051	102	10

#### Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

#### Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

TI certified concentration from NIST-2976.

Accuracy and precision for TI are not reported as the certified concentration is too close to the reportable detection limit.

# Teck Coal Limited Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_GANF_INV-1_2022-09-13_N	174	26 Sep 2022
	RG_GANF_INV-3_2022-09-13_N	175	·
	RG_GANF_INV-5_2022-09-13_N	176	
	RG_GAUT_INV-1_2022-09-14_N	177	
	RG_GAUT_INV-3_2022-09-14_N	178	
	RG_GAUT_INV-5_2022-09-14_N	179	
	RG_GHBP_INVOLI-1_2022-09-12_N	180	
	RG_GHBP_COMPOLI-1_2022-09-12_N	181	
02	RG_GHBP_INV-3_2022-09-12_N	182	27 Sep 2022
	RG_GHBP_INVOLI-5_2022-09-12_N	183	
	RG_GHBP_COMPOLI-5_2022-09-12_N	184	
	RG_GHDT_INV-1_2022-09-16_N	185	
	RG_GHDT_INV-3_2022-09-16_N	186	
	RG_GHDT_INV-5_2022-09-16_N	187	
	RG_GHFF_INV-1_2022-09-08_N	188	
	RG_GHFF_INV-3_2022-09-09_N	189	
	RG_GHFF_INV-5_2022-09-09_N	190	
	RG_GHNF_INV-1_2022-09-09_N	191	
	RG_GHNF_INV-3_2022-09-10_N	192	
	RG_GHNF_INV-5_2022-09-10_N	193	
	RG_GHUT_INV-1_2022-09-15_N	194	
	RG_GHUT_INV-3_2022-09-15_N	195	
	RG_GHUT_INV-5_2022-09-15_N	196	

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				the second									Email 4:	Lisa.Bow.	Lisa.Bowron@minnow.ca X	X	×
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Phone Numb	Phone Number 1-250-865-3048						Pho	Phone Number					PO number		VPO00818999	666	
	SAMPI	SAMPLE DETAILS	S							ANA	LYSIS R	ANALYSIS REQUESTED	CD C3		Filtered - F: Field, L: Lab, FL: Field & Lab, N: None	Lab, FL: Fiel	d & Lab
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RG_GANF_INV-3_2022-09-13_N /	RG_GANF	TA		13-Sep-22	10:00	INV	Composite	Composite	-	×	X	X					
THO RG GANF_INV-5_2022-09-13_N	RG_GANF	,TA		13-Sep-22	11:00	INV	Composite	Composite		×	X	x			3	1	
RG_GAUT_INV-1_2022-09-14_N /	RG_GAUT	TA		14-Sep-22	00:6	INV	Composite	Composite	-	x	X	x					
RG_GAUT_INV-3_2022-09-14_N /	RG_GAUT	TA		14-Sep-22	10:00	INV	Composite	Composite	-	10000	×	×				-	
RG_GAUT_INV-5_2022-09-14_N	RG_GAUT	TA		14-Sep-22	11:00	INV	Composite	Composite	_	I MANAGE	x	×					
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### Trich Analytics Inc.

#### Tissue Microchemistry Analysis Report

Client: Giovanna Diaz

Project Manager Teck Coal Limited

Phone: (250) 865-3048

**Email:** giovanna.diaz@teck.com; awiebe@minnow.ca;

lbowron@minnow.ca; teckcoal@equisonline.com; teck.lab.results@teck.com; aquascilab@teck.com

Client Project: REP_LAEMP_GC_2022-09 Regional Effects Program (PO 818999)

**Analytical Request:** Composite Benthic Invertebrate Tissue Microchemistry (total metals & moisture) - 5 samples.

See chain of custody form provided for sample identification numbers.

#### Notes:

Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg).

Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.

Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.

RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.

Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 101%.

Sample ID 813 was divided into two samples: 813A was shrimp and 813B was clams with shells.

Sample ID 815 was divided into two samples: 815A was shrimp & tiny worms and 815B was clams with shells.

Moisture content for sample ID 813A, B and 815A, B represents whole sample (i.e., ID 813 and 815 before separating tissues).

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio

Date

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TrichAnalytics Inc. 207-1753 Sean Heights Saanichton, BC V8M 0B3 www.trichanalytics.com



25 Oct 2022

Date Received:

Project No.:

Date of Analysis:

Final Report Date:

Method No.:

28 Sep 2022

19 Oct 2022

25 Oct 2022

MET-002.06

2022-415

Project No: 2022-415

		Client ID	RG_GHP_INV- 5_2022-09-19_N		RG_GHP_INVBIV- 6_2022-09-20_N	RG_GHP_INV- 3_2022-09-19_N	RG_GHP_INVBIV- 3_2022-09-19_N
		Client ID	5_2022-09-19_14	3_2022-09-19_11	0_2022-09-20_11	3_2022-09-19_11	3_2022-09-19_11
		Lab ID	813A	813B	814	815A	815B
	We	et Weight (g)	0.8351	0.8351	0.5869	0.5206	0.5206
		y Weight (g)	0.2631	0.2631	0.2226	0.1335	0.1335
		Moisture (%)	68.5	68.5	62.1	74.4	74.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.022	0.073	5.8	4.5	6.6	9.0	2.4
11B	0.107	0.357	13	12	21	27	6.8
23Na	4.6	15	1,328	1,337	838	3,835	1,592
24Mg	0.062	0.207	3,623	1,387	1,269	3,989	783
27Al	0.063	0.210	12,097	13,719	17,305	17,565	5,346
31P	60	200	19,706	1,993	1,010	7,805	1,702
39K	2.4	8.0	5,535	4,091	6,122	9,435	2,550
44Ca	3.1	10	84,225	174,784	182,701	34,842	226,246
49Ti	0.001	0.003	1,117	1,275	1,941	2,109	465
51V	0.028	0.093	23	25	44	44	10
52Cr	0.064	0.213	13	30	21	54	14
55Mn	0.008	0.027	273	116	67	225	55
57Fe	0.795	2.7	3,316	3,206	4,835	6,754	2,016
59Co	0.019	0.063	3.3	3.6	3.1	5.5	1.5
60Ni	0.001	0.003	36	62	38	110	27
63Cu	0.029	0.097	40	23	12	60	12
66Zn	0.216	0.720	81	41	36	153	36
75As	0.398	1.3	4.9	1.6	2.0	2.7	0.758
77Se	0.375	1.2	12	6.8	4.9	27	5.3
88Sr	0.001	0.003	95	83	97	52	119
95Mo	0.001	0.003	0.761	0.865	0.870	1.1	0.363
107Ag	0.001	0.003	1.3	0.306	0.140	0.582	0.144
111Cd	0.068	0.227	0.965	0.408	0.482	3.9	0.835
118Sn	0.020	0.067	1.1	0.449	0.913	1.8	0.394
121Sb	0.003	0.010	0.299	0.376	0.507	0.513	0.135
137Ba	0.001	0.003	332	186	309	395	115
202Hg	0.027	0.090	0.092	0.036	0.057	0.373	0.075
205Tl	0.001	0.003	0.239	0.192	0.265	0.329	0.080
208Pb	0.001	0.003	2.7	2.5	5.9	5.1	1.4
238U	0.001	0.003	0.618	0.447	0.617	0.888	0.205

#### Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

### Teck Coal Limited Tissue QA/QC Relative Percent Difference Results

Client ID	RG_GHP_INVBIV-5_2022-09-19_N
Lab ID	813B

Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.022	4.5	6.1	30
11B	0.107	12	17	35
23Na	4.6	1,337	1,527	13
24Mg	0.062	1,387	2,016	37
27Al	0.063	13,719	15,622	13
31P	60	1,993	2,002	0.5
39K	2.4	4,091	5,617	31
44Ca	3.1	174,784	194,352	11
49Ti	0.001	1,275	1,523	18
51V	0.028	25	30	18
52Cr	0.064	30	28	6.9
55Mn	0.008	116	121	4.2
57Fe	0.795	3,206	4,455	33
59Co	0.019	3.6	4.4	20
60Ni	0.001	62	52	18
63Cu	0.029	23	26	12
66Zn	0.216	41	52	24
75As	0.398	1.6	1.6	-
77Se	0.375	5.7	5.8	1.7
88Sr	0.001	83	85	2.4
95Mo	0.001	0.865	0.924	6.6
107Ag	0.001	0.306	0.257	17
111Cd	0.068	0.408	0.501	-
118Sn	0.020	0.449	0.659	38
121Sb	0.003	0.376	0.447	17
137Ba	0.001	186	218	16
202Hg	0.027	0.036	0.036	-
205TI	0.001	0.192	0.222	15
208Pb	0.001	2.5	3.3	28
238U	0.001	0.447	0.435	2.7

#### Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

#### Data Quality Objectives:

Laboratory Duplicates - RPD  $\leq$ 40% for all elements, except Ca and Sr, which are  $\leq$ 60% Minimum DQOs apply to individual samples at concentrations above 10x DL

Project No: 2022-415

### Teck Coal Limited Tissue QA/QC Accuracy and Precision Results

Sample Group ID	01

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.022	1.21	1.1	89	4.1
11B	0.107	4.5	4.1	92	3.2
23Na	4.6	14,000	12,984	93	5.6
24Mg	0.062	910	848	93	3.6
27Al	0.063	197.2	189	96	5.8
31P	60	8,000	7,474	93	3.8
39K	2.4	15,500	14,851	96	2.8
44Ca	3.1	2,360	2,259	96	6.3
49Ti	0.001	12.24	11	90	9.3
51V	0.028	1.57	1.6	103	8.0
52Cr	0.064	1.87	1.8	96	6.8
55Mn	0.008	3.17	3.0	95	4.1
57Fe	0.795	343	331	96	3.0
59Co	0.019	0.25	0.273	109	3.9
60Ni	0.001	1.34	1.4	104	5.1
63Cu	0.029	15.7	16	103	2.8
66Zn	0.216	51.6	50	97	2.8
75As	0.398	6.87	7.0	102	2.0
77Se	0.375	3.45	3.5	101	6.6
88Sr	0.001	10.1	9.4	93	1.5
95Mo	0.001	0.29	0.290	100	12
107Ag	0.001	0.0252	0.024	97	13
111Cd	0.068	0.299	0.327	109	16
118Sn	0.020	0.061	0.064	105	7.4
121Sb	0.003	0.011	0.009	80	11
137Ba	0.001	8.6	7.6	88	3.5
202Hg	0.027	0.412	0.471	114	11
205Tl	0.001	0.0013	-	-	-
208Pb	0.001	0.404	0.350	87	12
238U	0.001	0.05	0.045	91	7.1

#### Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

#### Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

TI certified concentration from NIST-2976.

Accuracy and precision for TI are not reported as the certified concentration is too close to the reportable detection limit.

# Teck Coal Limited Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
	RG_GHP_INV-5_2022-09-19_N RG_GHP_INVBIV-5_2022-09-20_N RG_GHP_INVBIV-3_2022-09-19_N RG_GHP_INVBIV-3_2022-09-19_N RG_GHP_INVBIV-3_2022-09-19_N	813A 813B 814 815A 815B	Analysis 19 Oct 2022

Page 5 of 7

Lab Name Contact   Jean Particular   Lab Name Christensen   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 1: Agust   Email 2: Agust   Email 3: Agust   Email 3: Agust   Email 3: Agust   Email 3: Agust   Email 3: Agust   Email 3: Agust   Email 4: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 5: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Email 6: Agust   Agust   Email 6: Agust   Agust   Email 6: Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Email 6: Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   Agust   A		COCID	REP_LAEMP_GC_09 TRICH	AEMP 09 TR	GC_2(CH	_2022-	TUR	TURNAROUND TIME:	D TIME:						RUSH:	Can		
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RG_GHP_INV8JV6_2012-09-19_N         RC_GHP         TA         19-86p-22         11-150         INV         Composite         1         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X	Sample ID	(sys loc code)	Matrix	-	Jate	24hr)	type		Structure	N	W	w)				-	-	
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RG_GHP_INVA_J002-06-19_N         RG_GHP         TA         19-Sep-22         11:10         INV         Composite         1         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X         X		RG_GHP	TA	20	Sep-22	11:05	INV	INVBIV	Composite			х	×					
RC_CHP_INVBIV-3.022-09-19_N   RC_CHP	RG_GHP_INV-3_2022-09-19_N	RG_GHP	TA	19	Sep-22	11:10	INV		Composite			×	X					
RG_GHP	36 RG_GHP_INVBIV-5_2022-09-19_N	RG_GHP	TA	61	Sep-22	11:00	INV	INVBIV	Composite			х	×				+	
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red - F: Field, L: Lab, FL: Field & Lab, N: Non EDD 110:50 Project # 2022 - 40 PDF DATE/TIME VPO00818999 Excel September 26, 2022 29 Sep 2022 5195003444 OTHER INFO Teck Lab Results@teck.com Ibowron@minnow.ca Report Format / Distribution RUSH: ACCEPTED BY/AFFILIATION Jepene la Bine PO number Email 1: Email 3: Email 4: Email 5: Email 6: Email 2: Date/Time ANALYSIS REQUESTED Mobile # mm Gravimetry × X × Email jennie.christensen@trichanalytics Moisture Content by Province BC dercury in Biota by wet, dry & routine) × × Address 207-1753 Sean Heights Lab Name TrichAnalytics Inc. Lab Contact Jennie Christensen ############## Metals in Biota by CRC (wet and dry) DATE/TIME × × Saanichton LABORATORY Sumber of Confeiners ---PRESERV. BHF Jennifer Ings 1 of TURNAROUND TIME: City Postal Code Phone Number Structure Sample Composite Composite Composite Composite Composite Tissue RELINQUISHED BY/AFFILIATION 11:95 C. JAV Page Tissue type Jennifer Ings IN BC Canada Time (24hr) REP_LAEMP_GC_2022-11:00 Sampler's Signature Sampler's Name A SECTION OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE PERSON OF THE 3 19-Sep-22 09 TRICH 19-Sep-22 19-Sep-22 Date Province Country Hazardous Material (Yes/No) SAMPLE DETAILS Emergency (1 Business Day) - 100% surcharge Regular (default) Priority (2-3 business days) - 50% surcharge For Emergency <1 Day, ASAP or Weekend Field Matrix LA TA TA Facility Name / Job# Regional Effects Program Email giovanna.diaz@teck.com Sparwood V0B 2G0 PROJECT/CLIENT INFO > ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS Sample Location SERVICE REQUEST (rush - subject to availability) (sys loc code) Phone Number 1-250-865-3048 Project Manager Giovanna Diaz Address 421 Pine Ave RG_GHP RG_GHP RG_GHP PO 818999 City Postal Code Sample ID 314 RG_GHP_INV-2_2022-09-19_N 315 RG_GHP_INV-3_2022-09-19_N RG_GHP_INV-1_2022-09-19_N Frehild \$13

# APPENDIX E WATER QUALITY

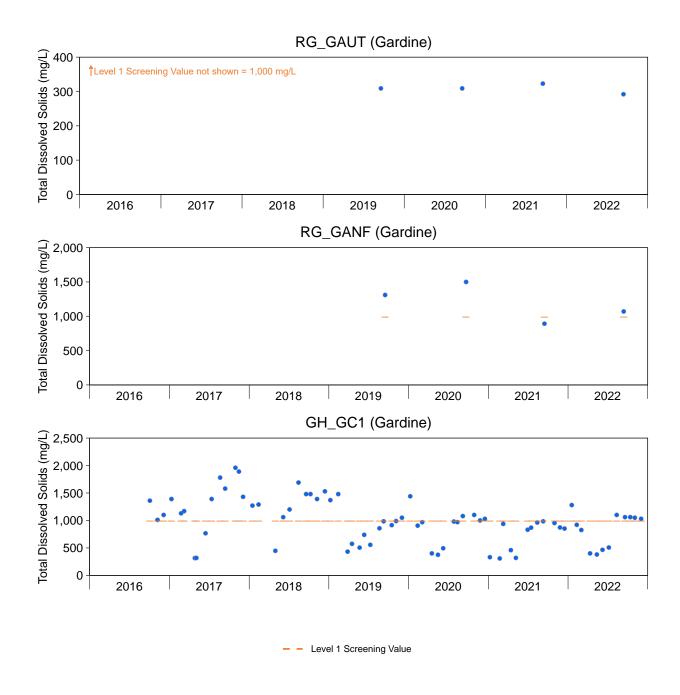


Figure E.1: Total Dissolved Solids Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

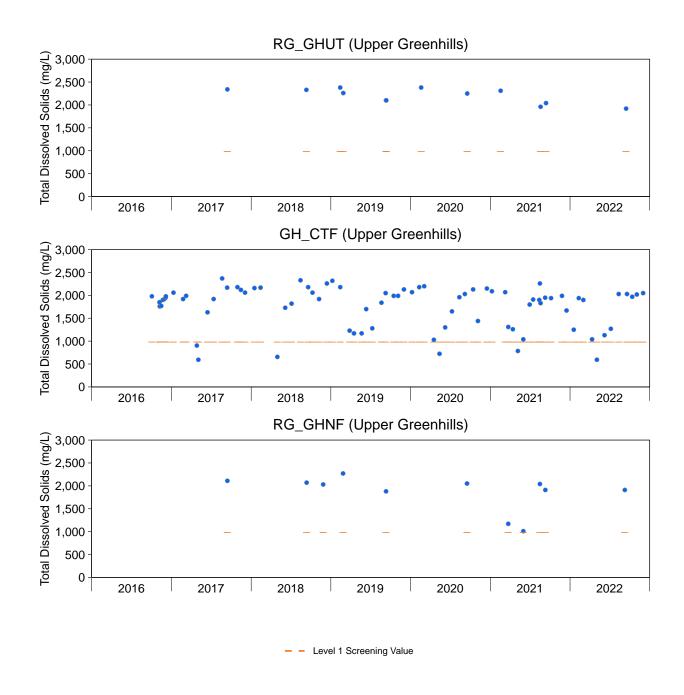


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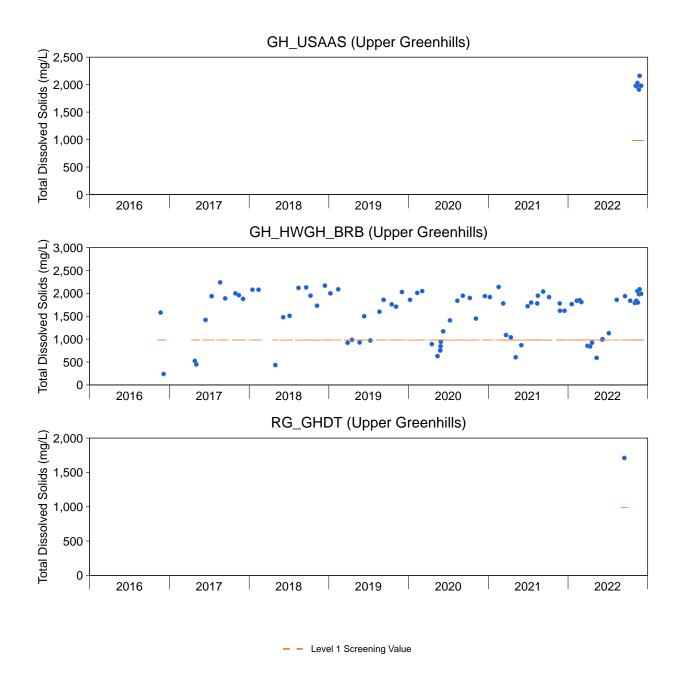


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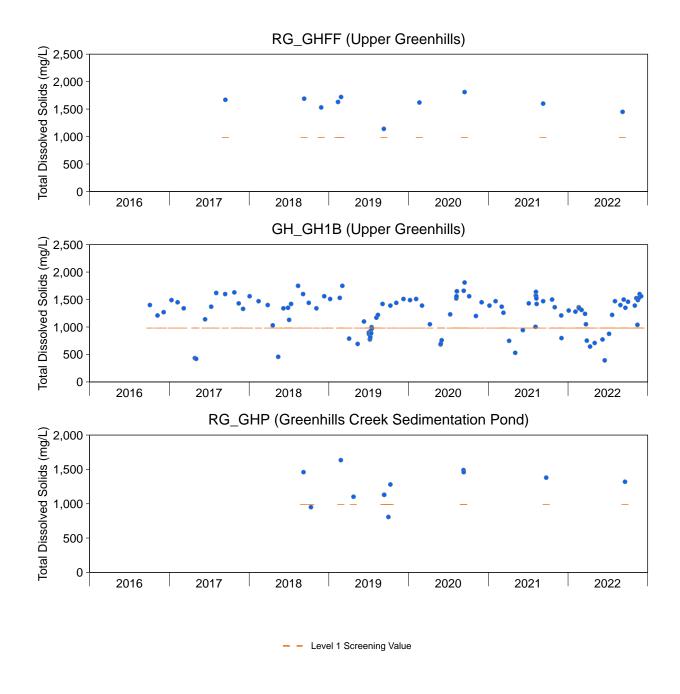


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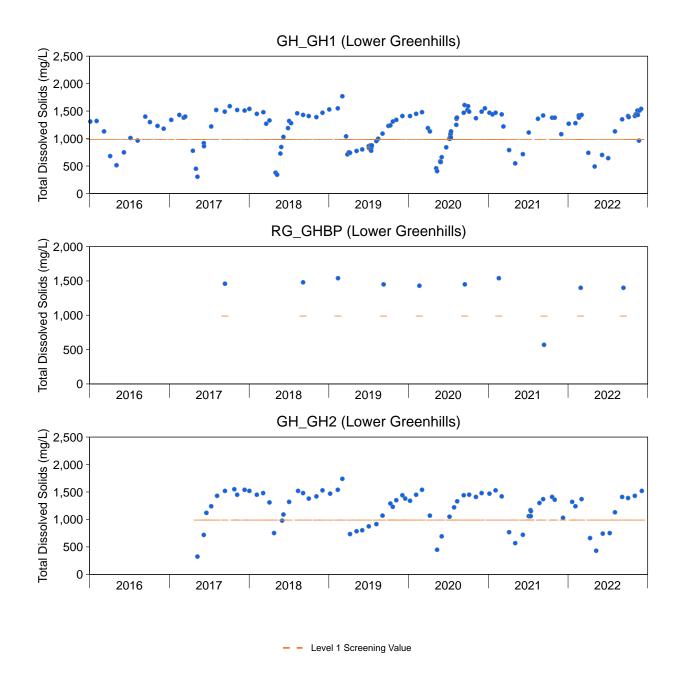


Figure E.1: Total Dissolved Solids Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

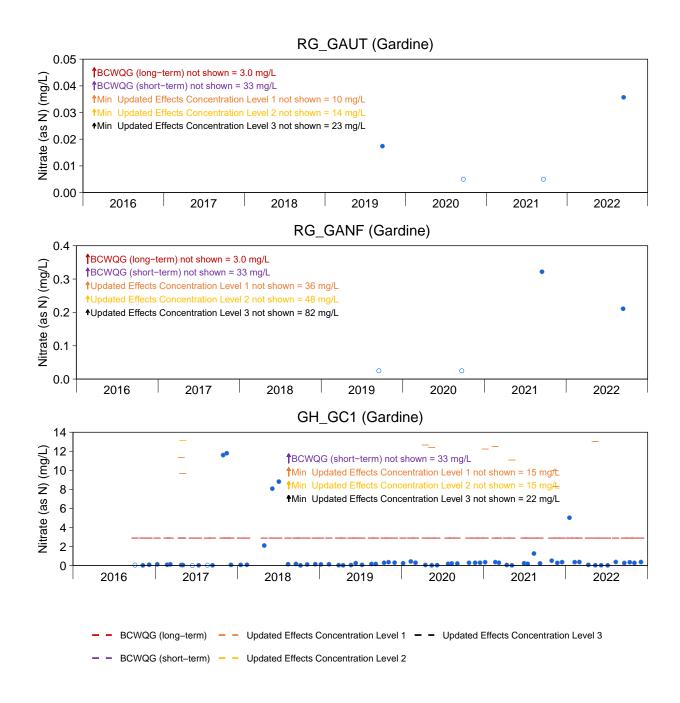


Figure E.2: Nitrate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

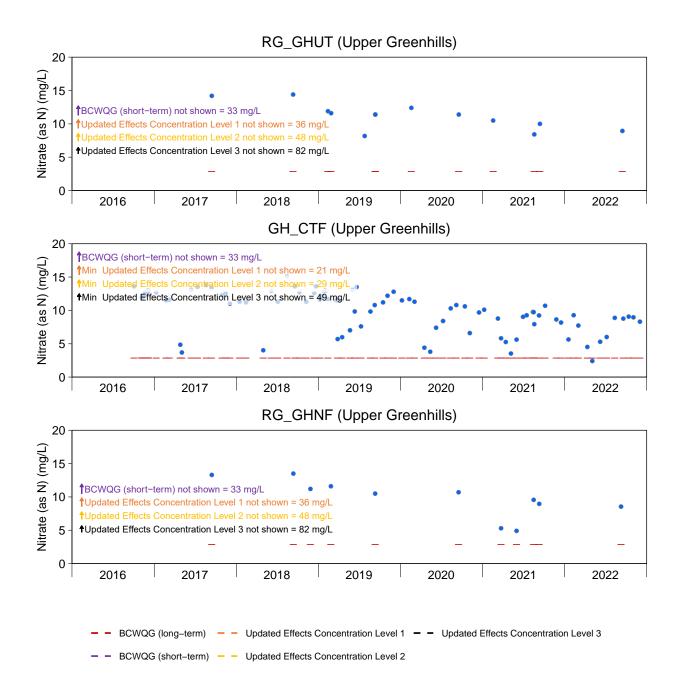


Figure E.2: Nitrate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

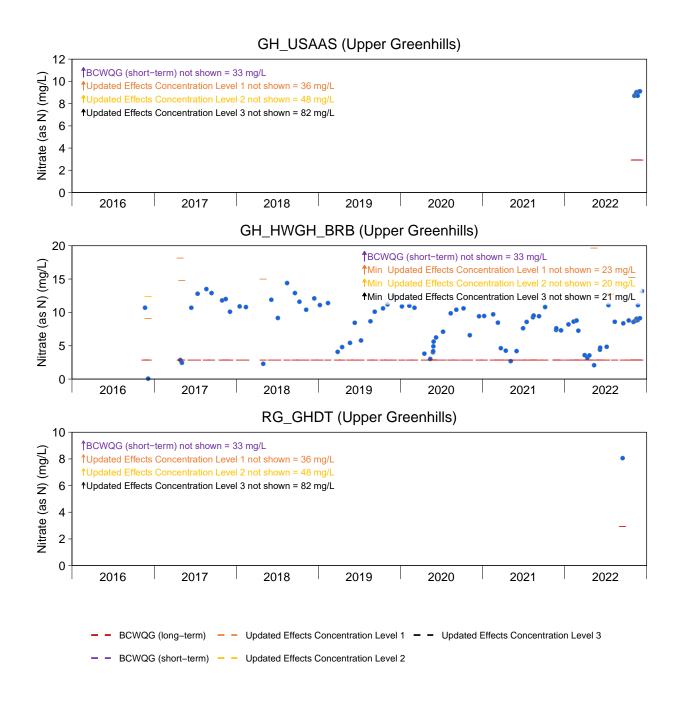


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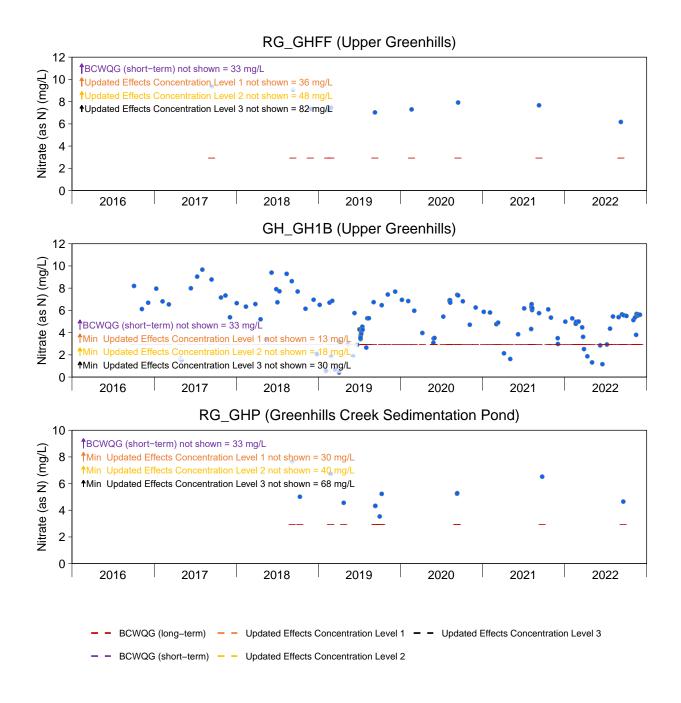


Figure E.2: Nitrate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

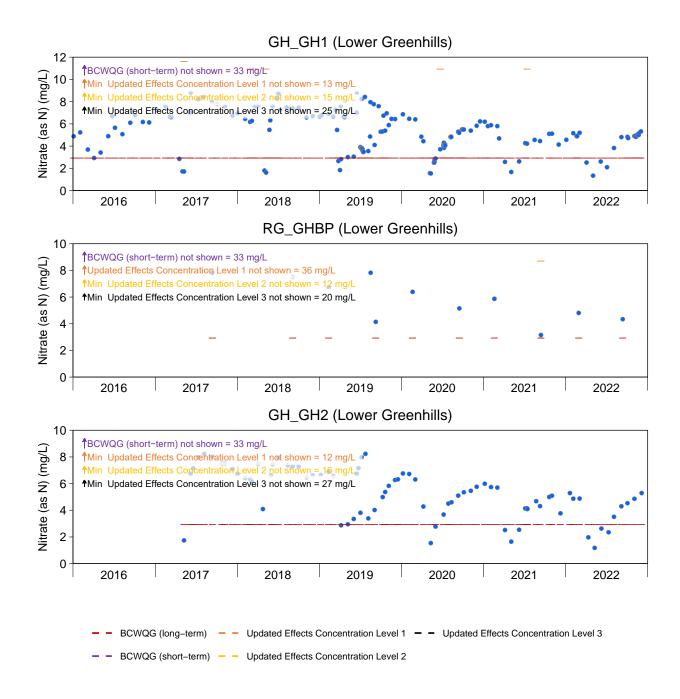


Figure E.2: Nitrate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

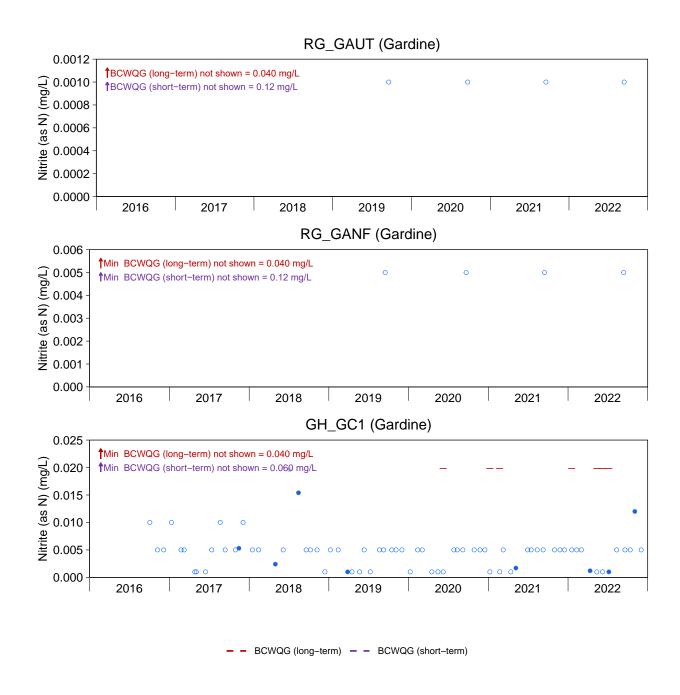


Figure E.3: Nitrite Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

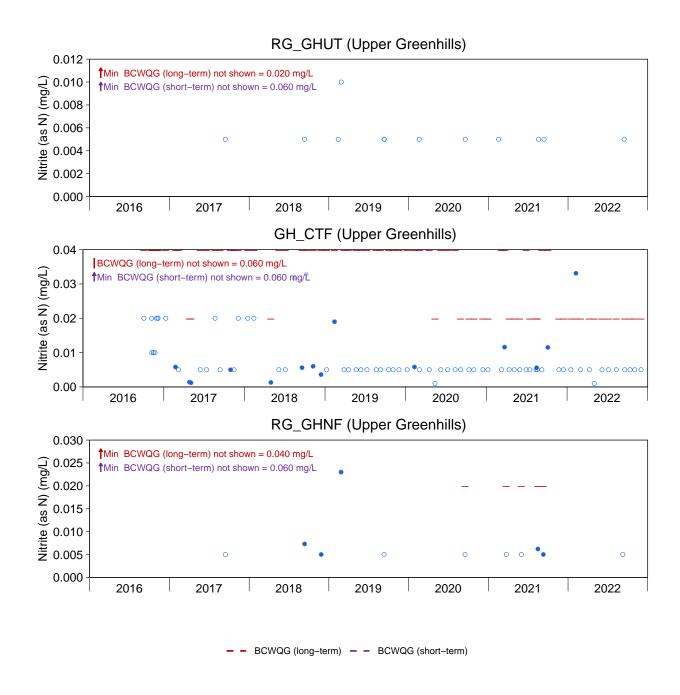


Figure E.3: Nitrite Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

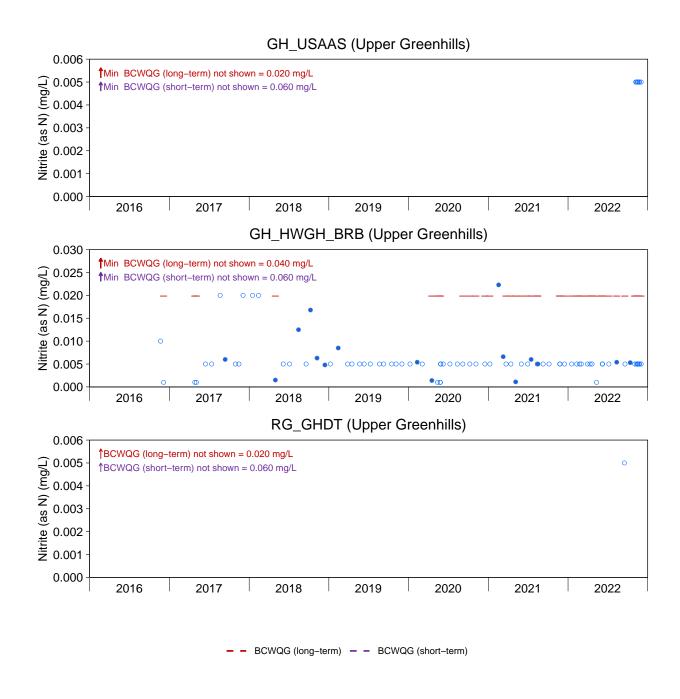


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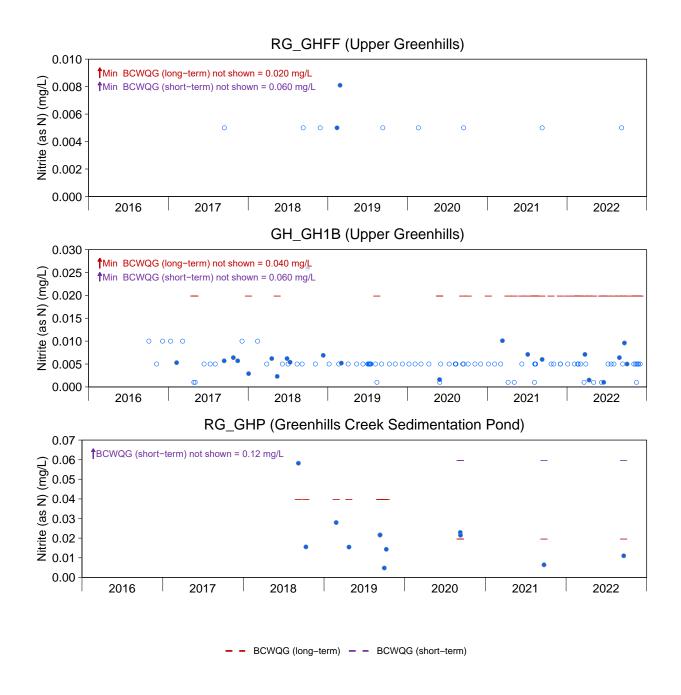


Figure E.3: Nitrite Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

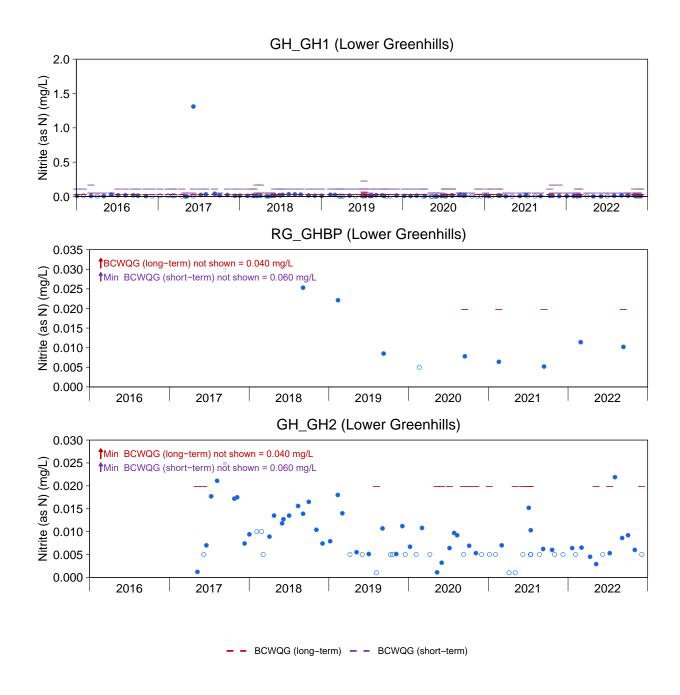


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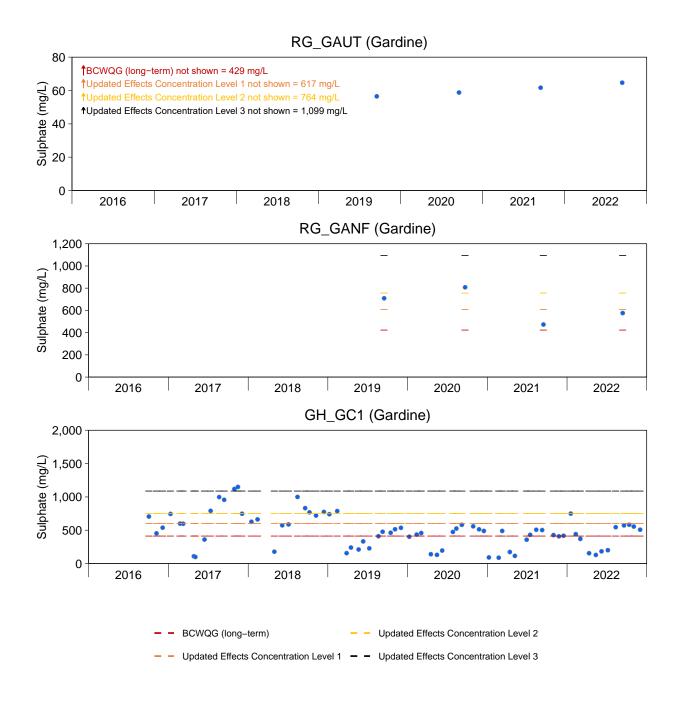


Figure E.4: Sulphate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

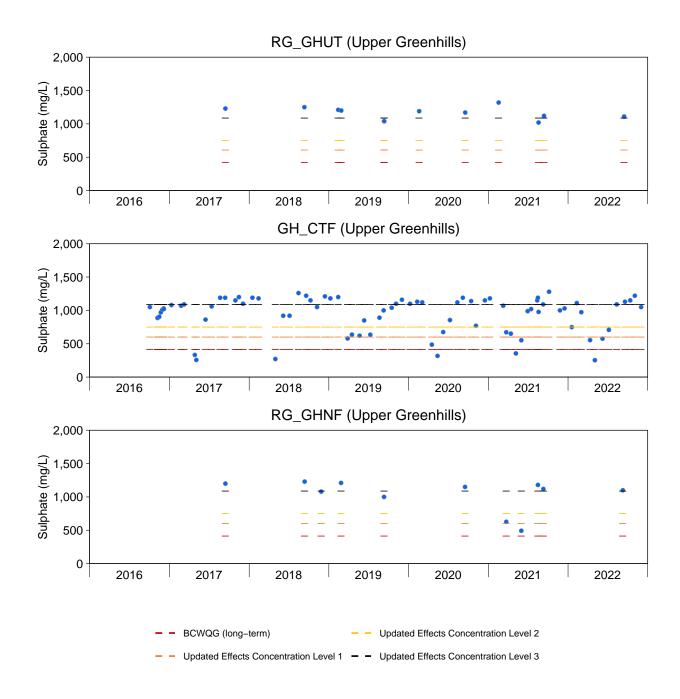


Figure E.4: Sulphate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

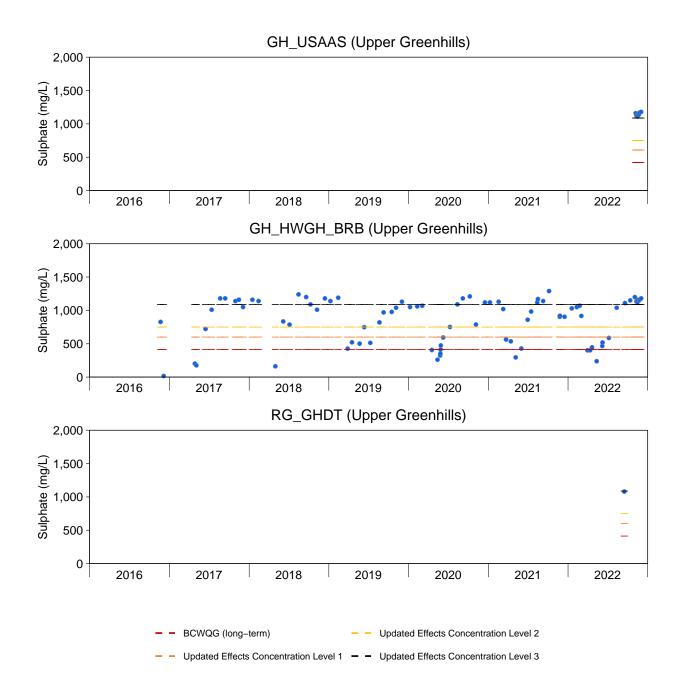


Figure E.4: Sulphate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

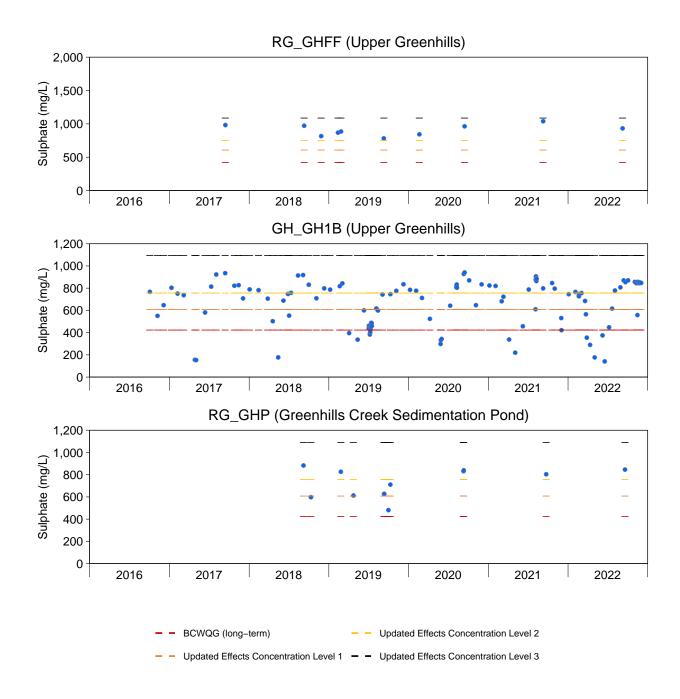


Figure E.4: Sulphate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

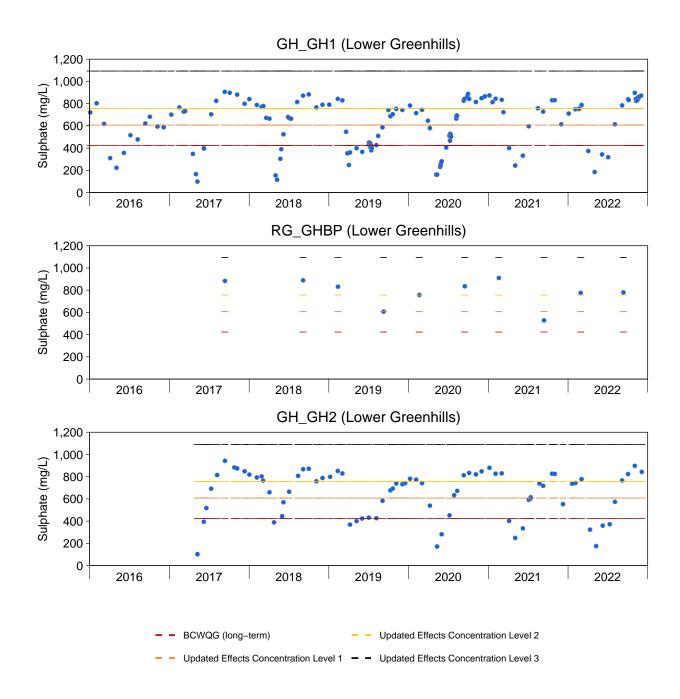


Figure E.4: Sulphate Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

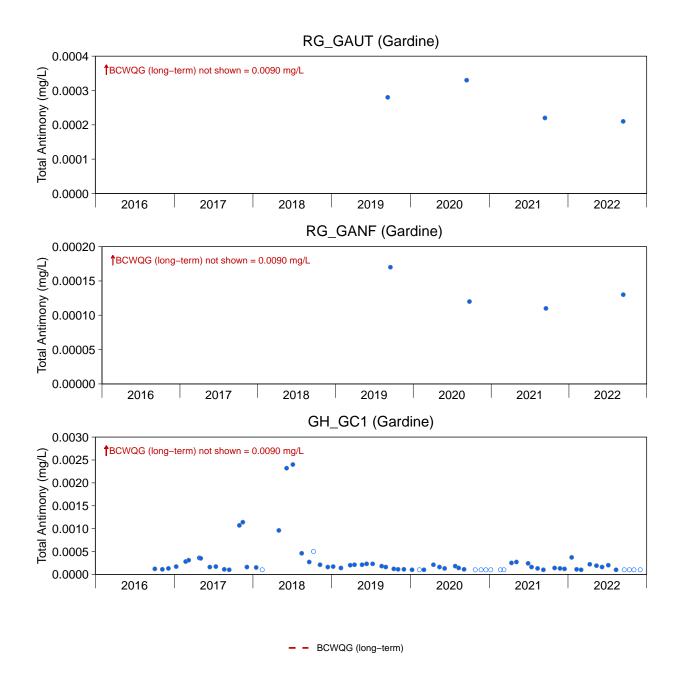


Figure E.5: Total Antimony Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

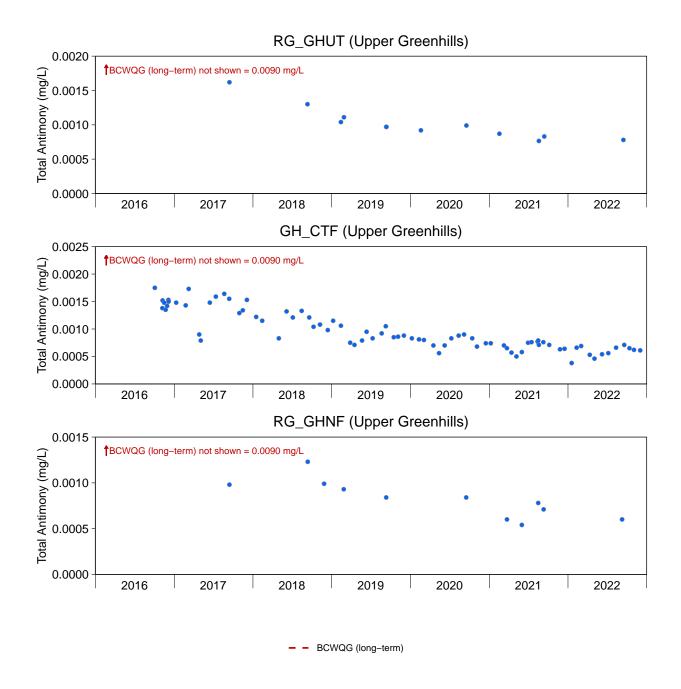


Figure E.5: Total Antimony Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

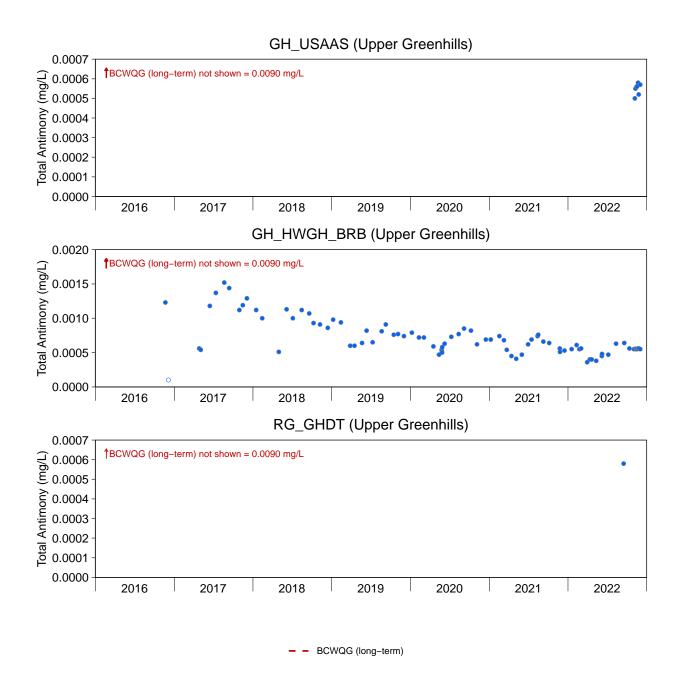


Figure E.5: Total Antimony Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

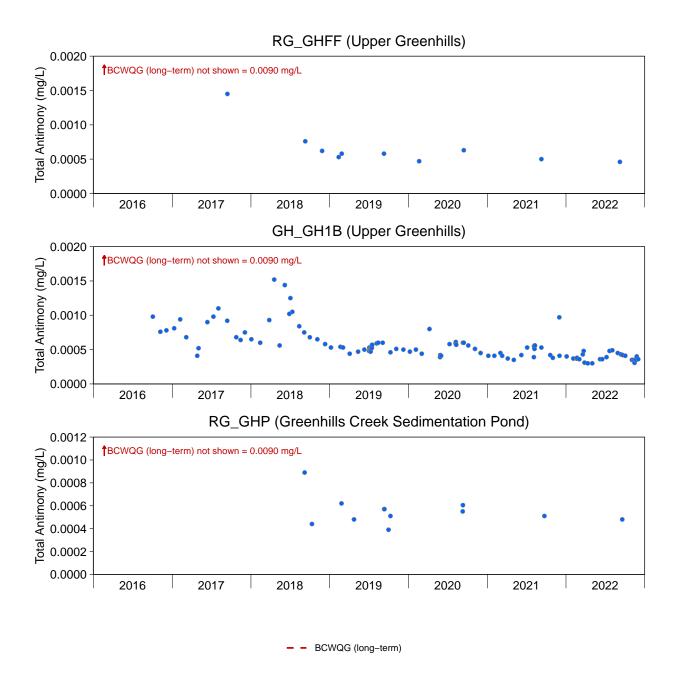


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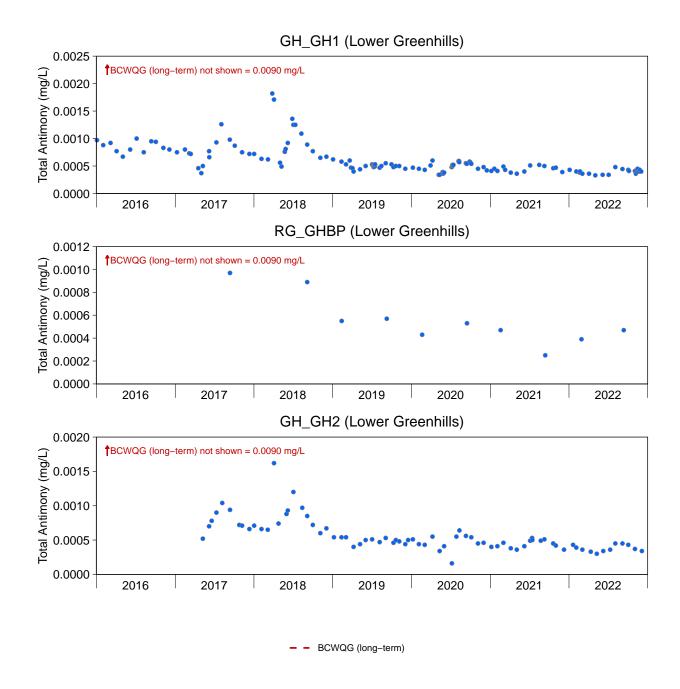


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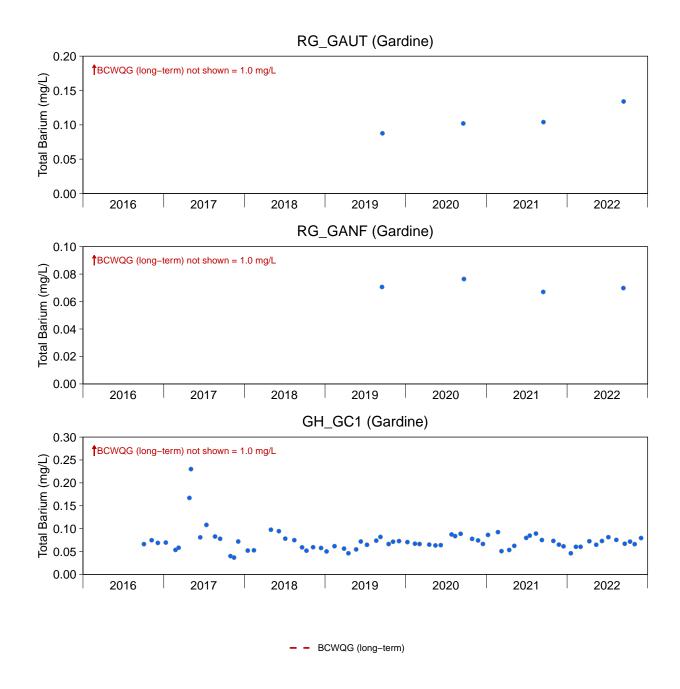


Figure E.6: Total Barium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

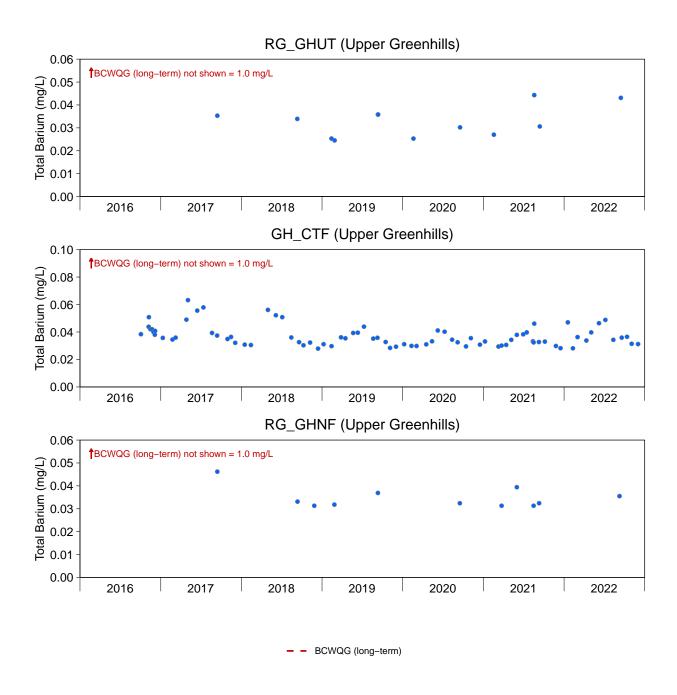


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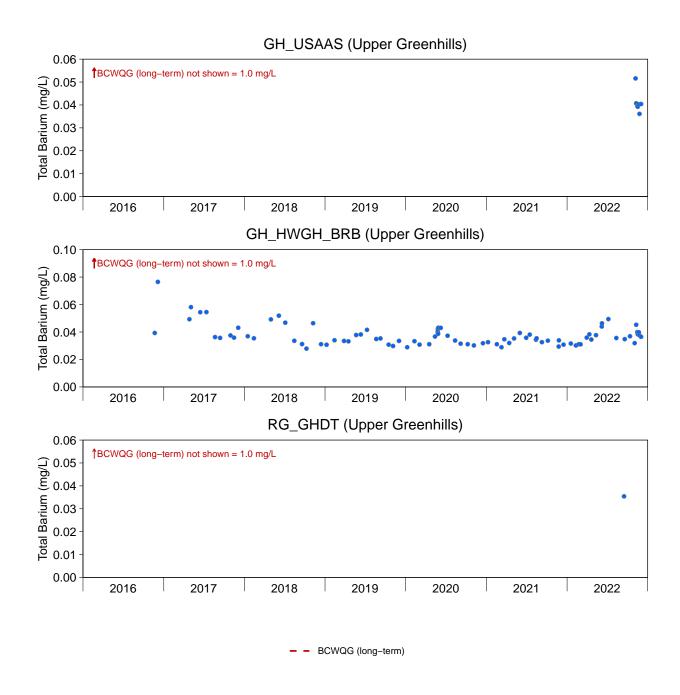


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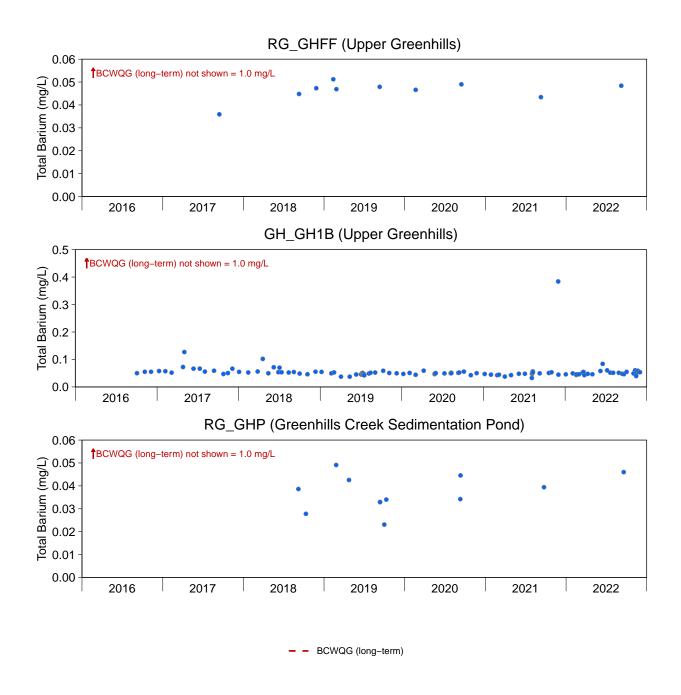


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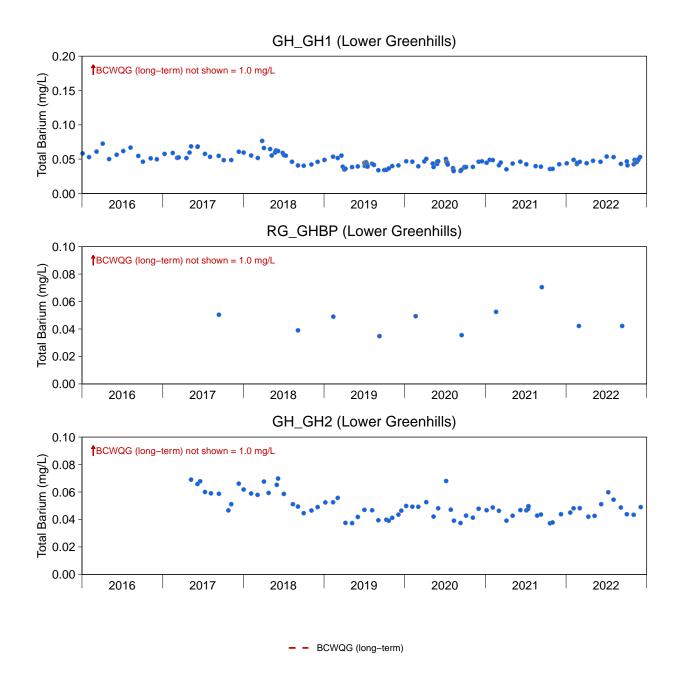


Figure E.6: Total Barium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

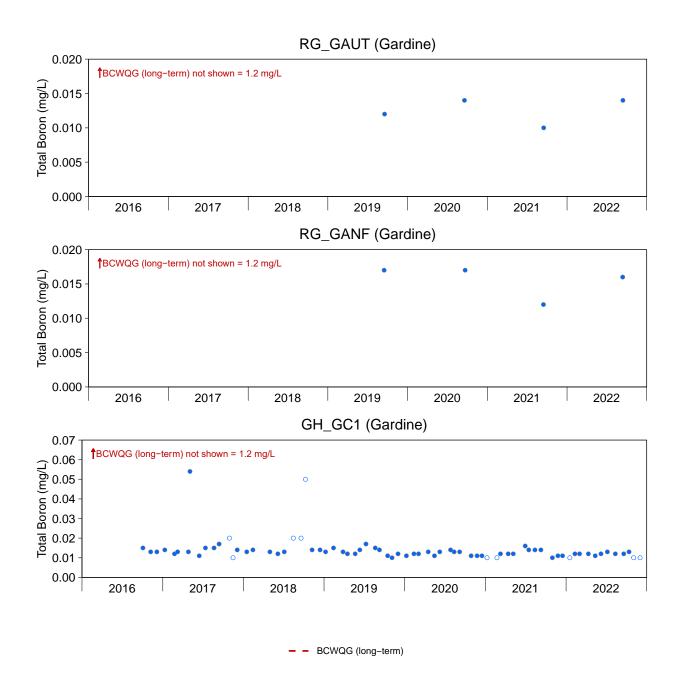


Figure E.7: Total Boron Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

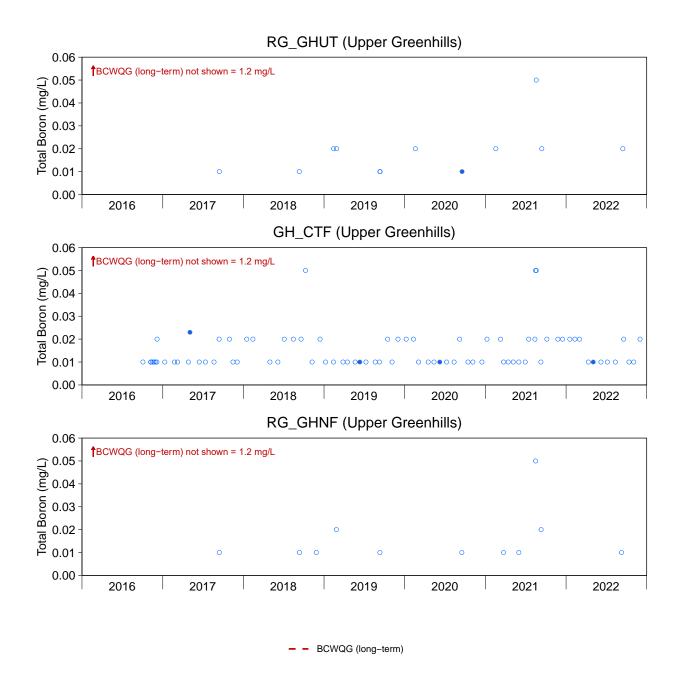


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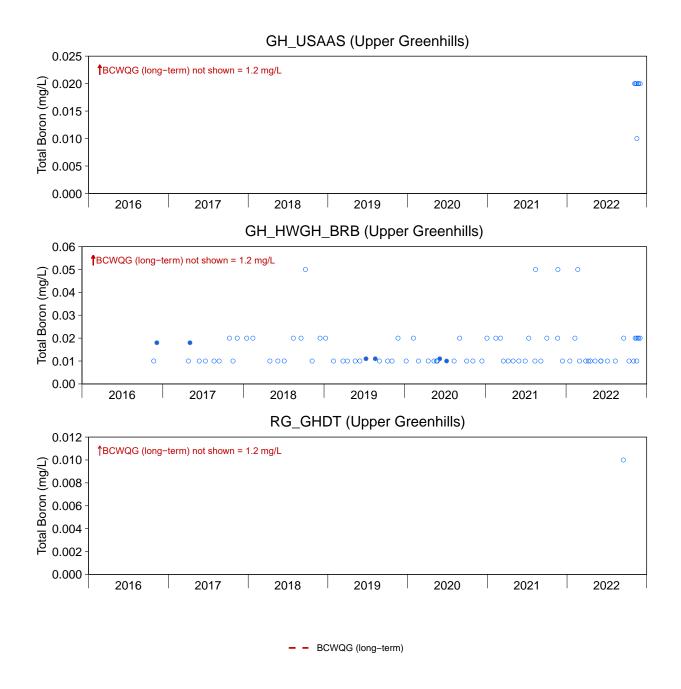


Figure E.7: Total Boron Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

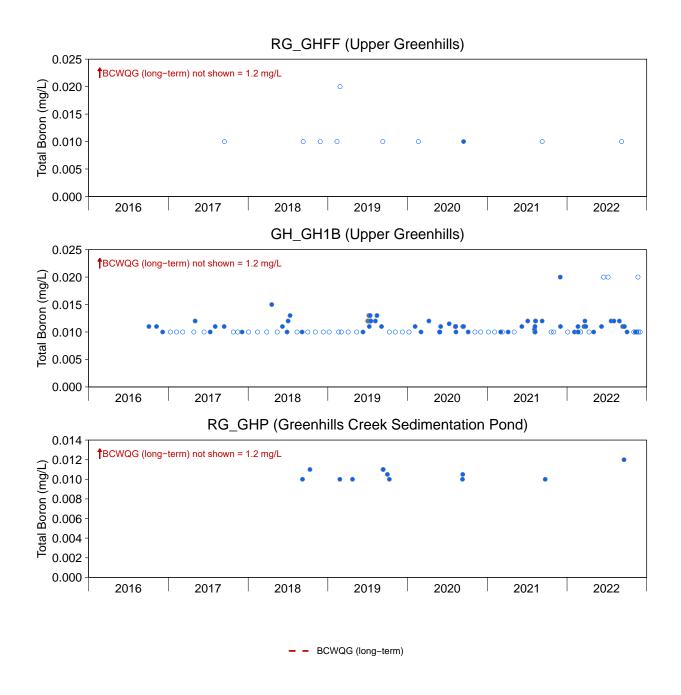


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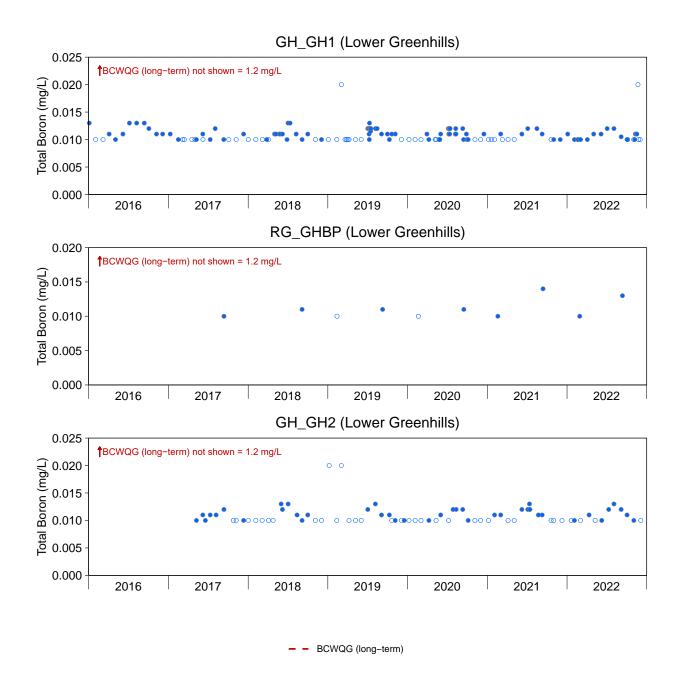


Figure E.7: Total Boron Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

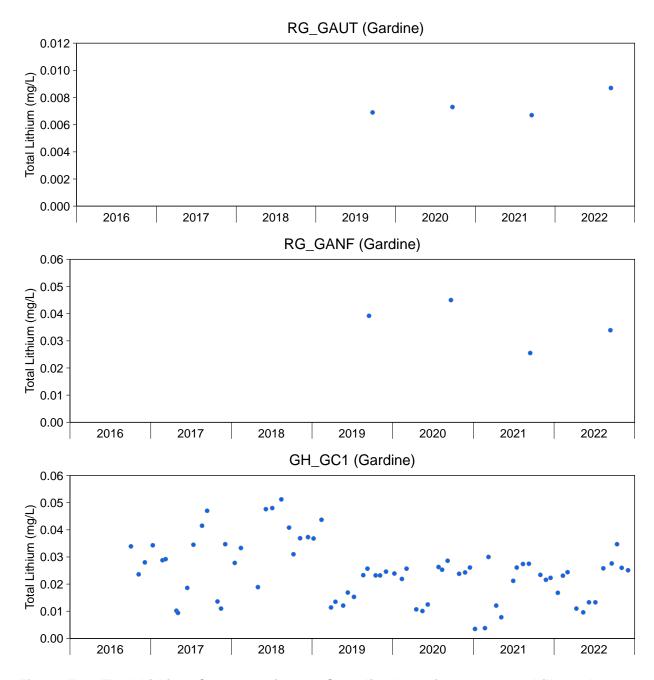


Figure E.8: Total Lithium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

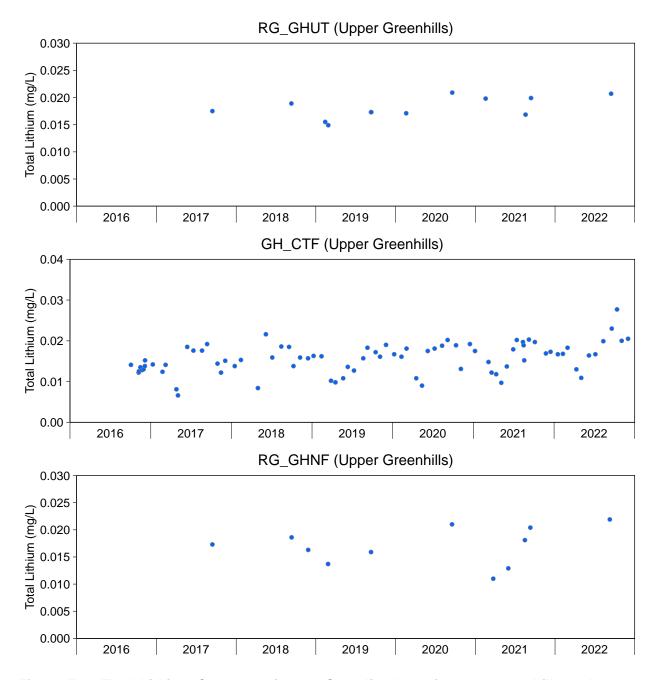


Figure E.8: Total Lithium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

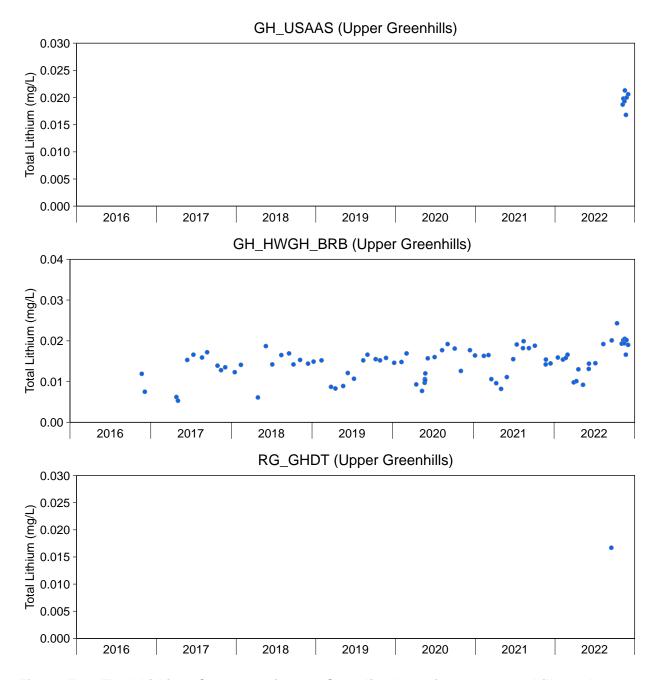


Figure E.8: Total Lithium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

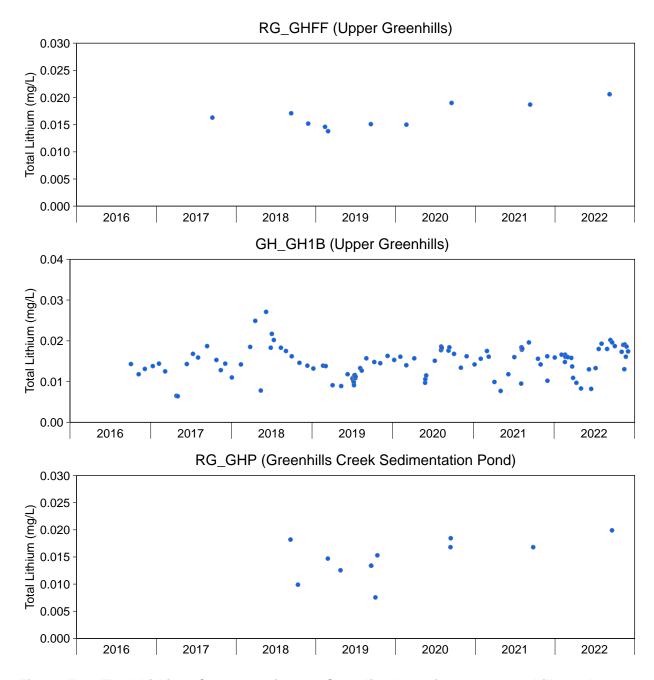


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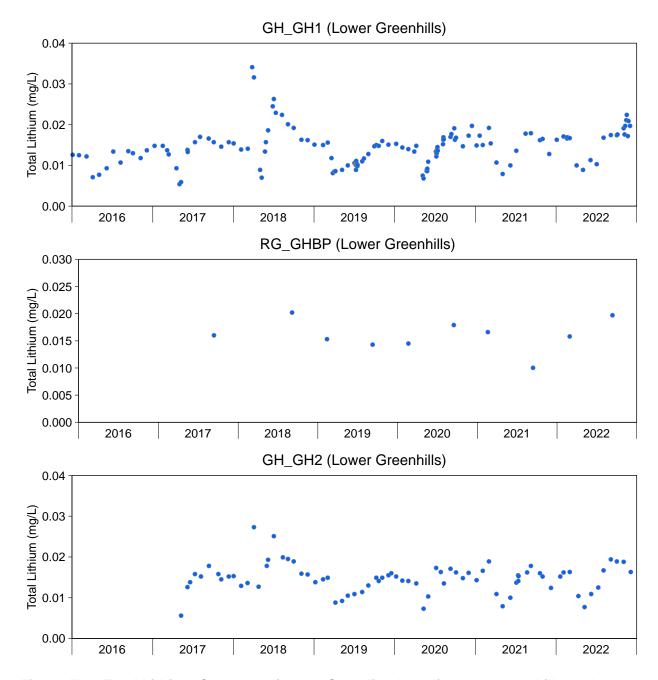


Figure E.8: Total Lithium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

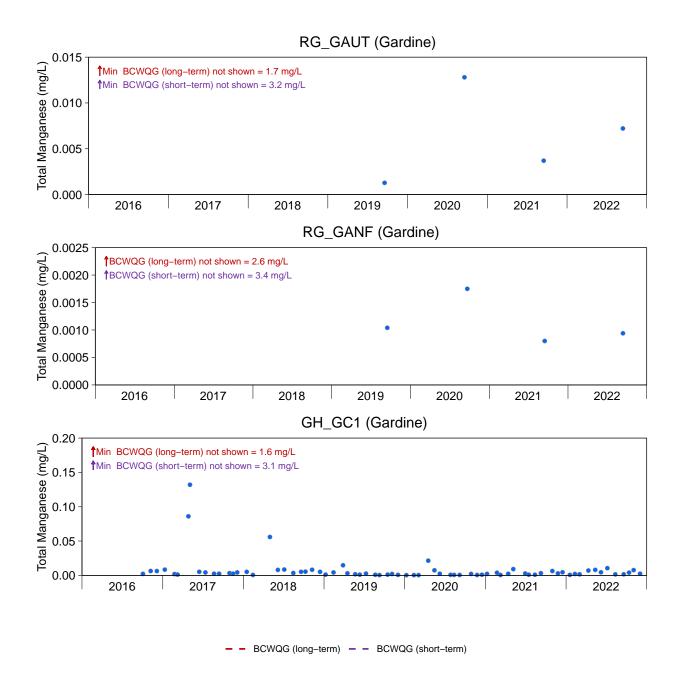


Figure E.9: Total Manganese Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

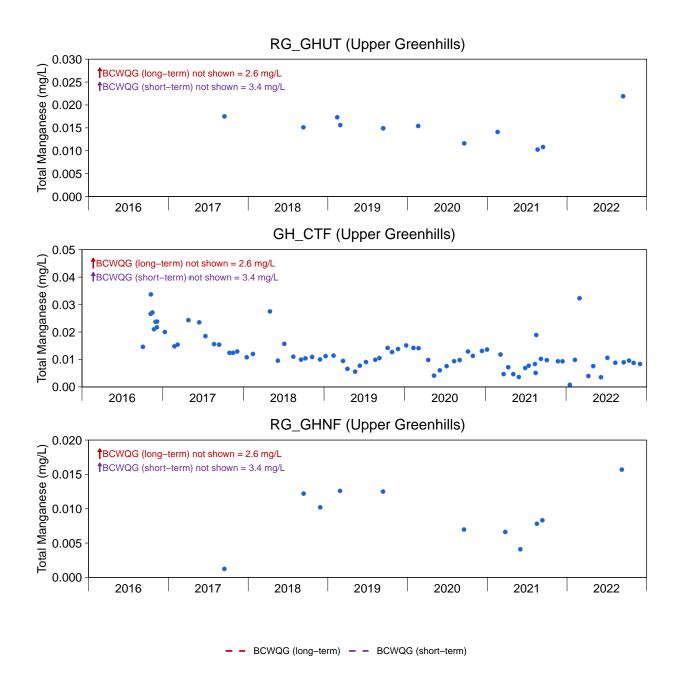


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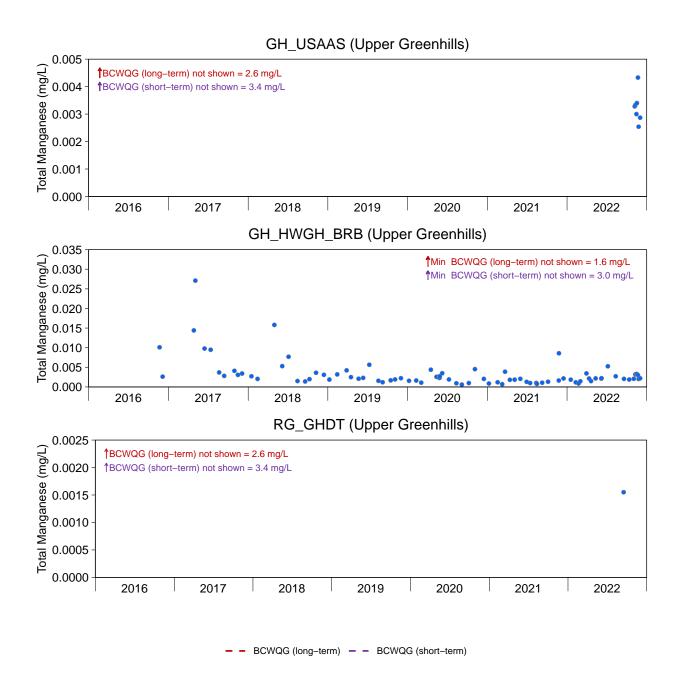


Figure E.9: Total Manganese Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

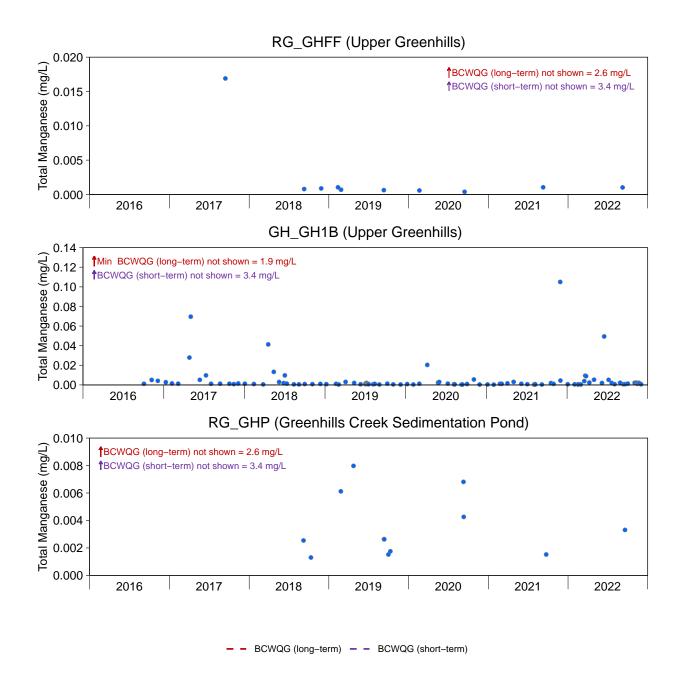


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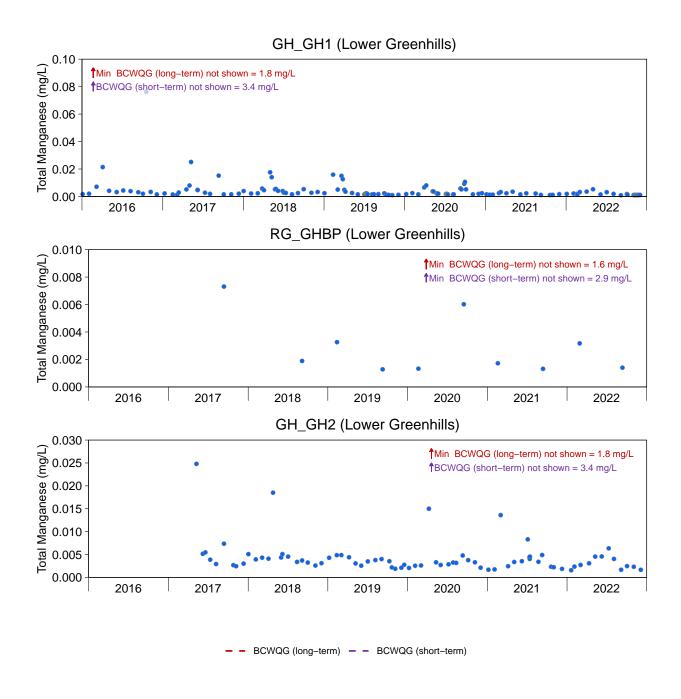


Figure E.9: Total Manganese Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

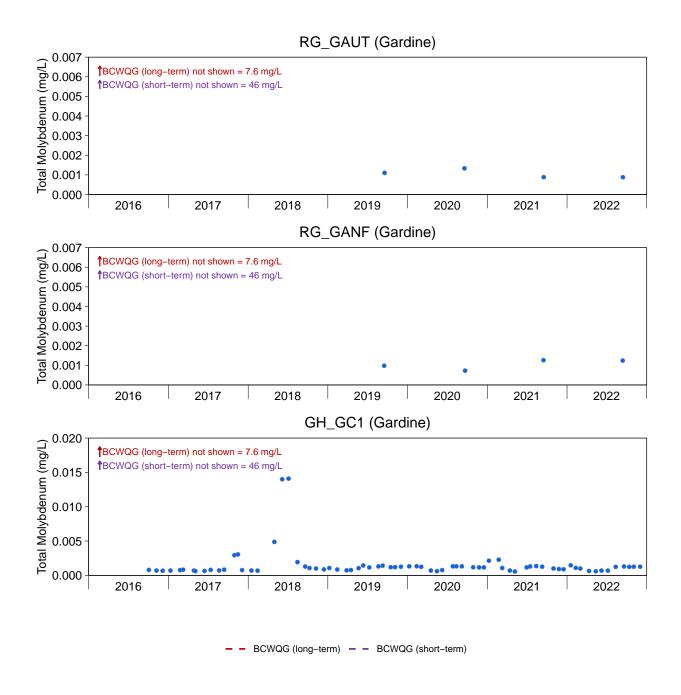


Figure E.10: Total Molybdenum Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

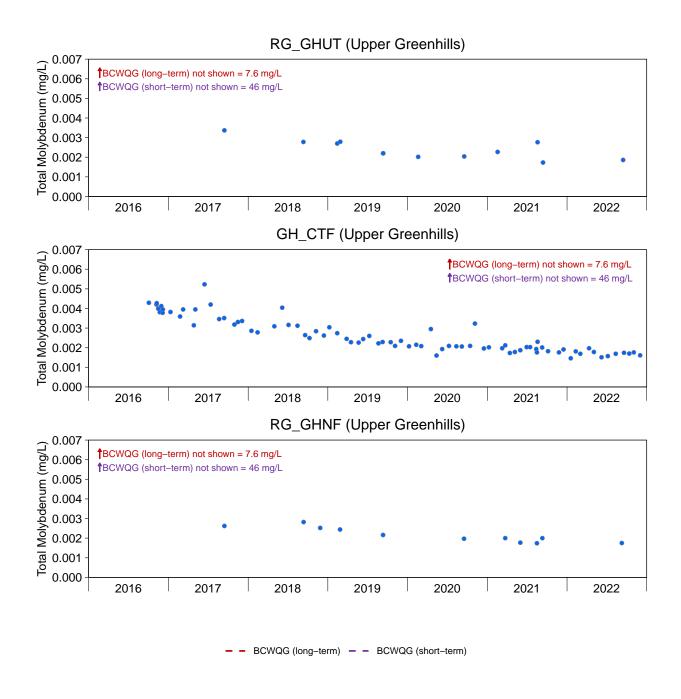


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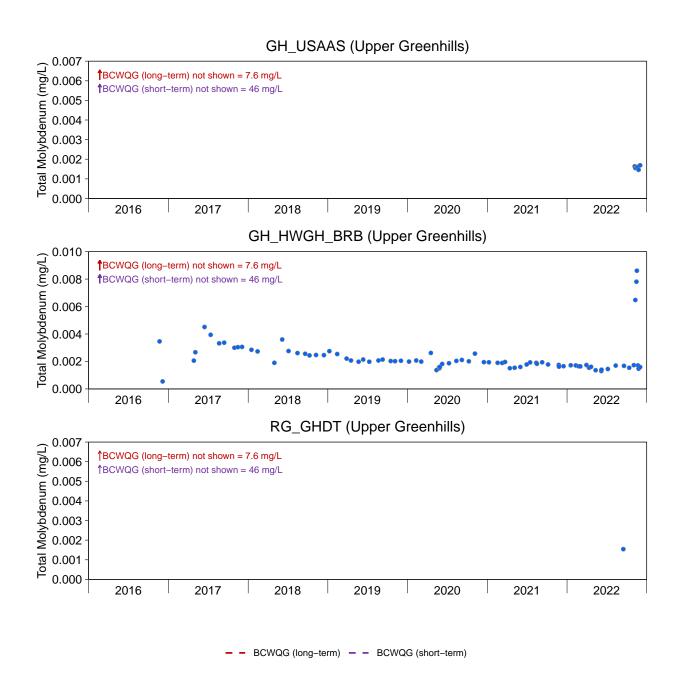


Figure E.10: Total Molybdenum Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

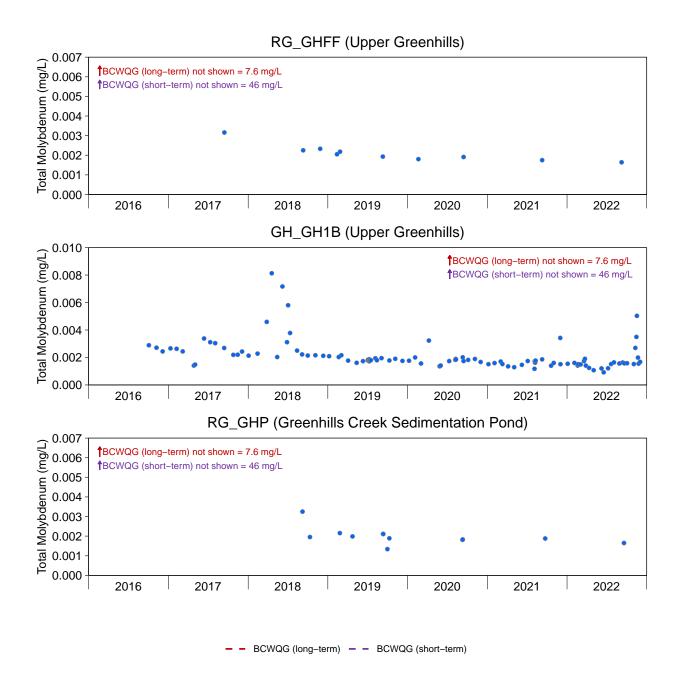


Figure E.10: Total Molybdenum Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

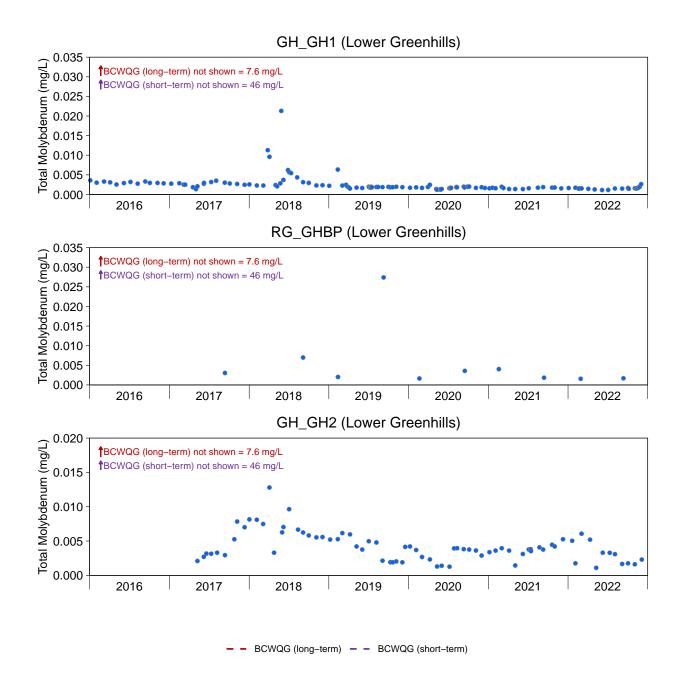


Figure E.10: Total Molybdenum Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

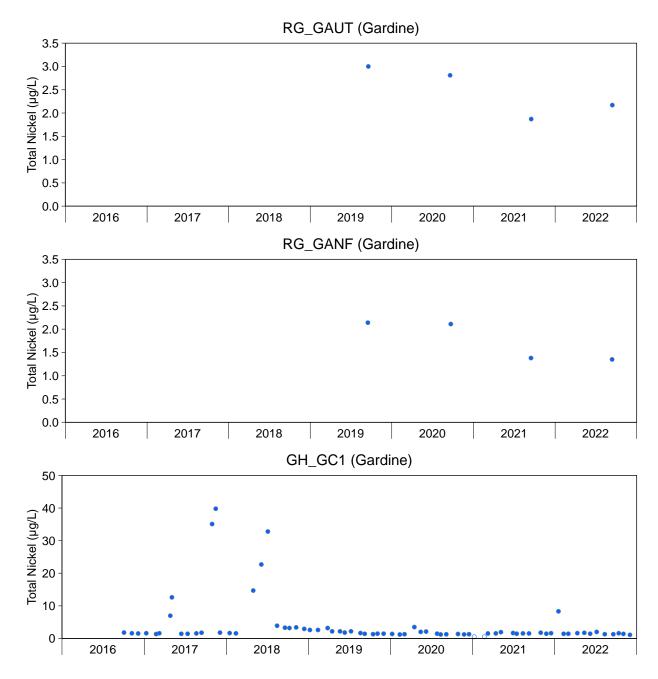


Figure E.11: Total Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

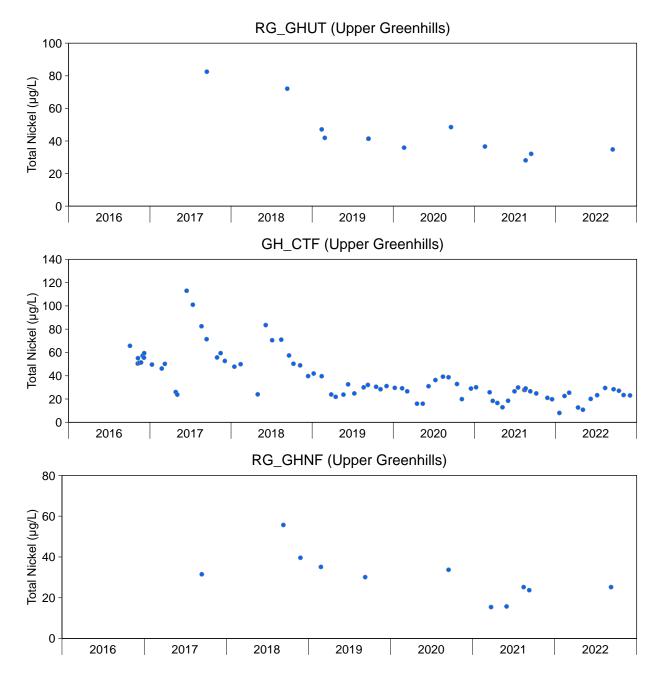


Figure E.11: Total Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

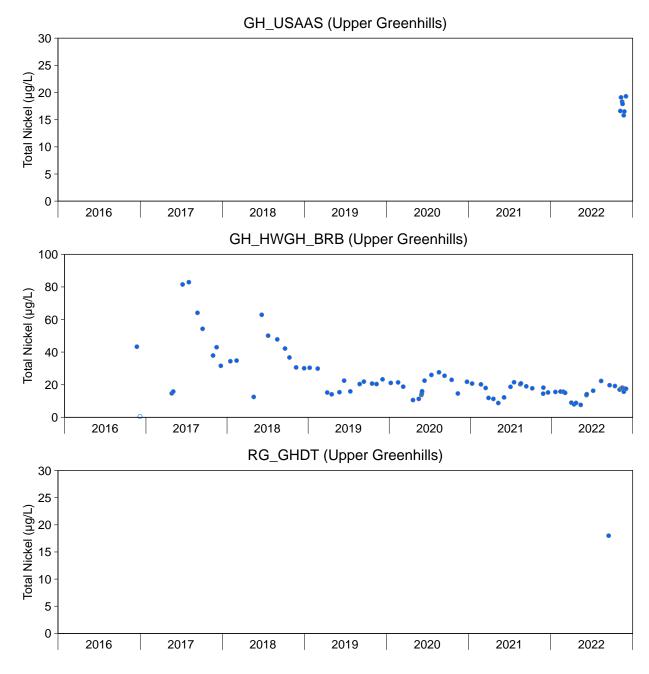


Figure E.11: Total Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

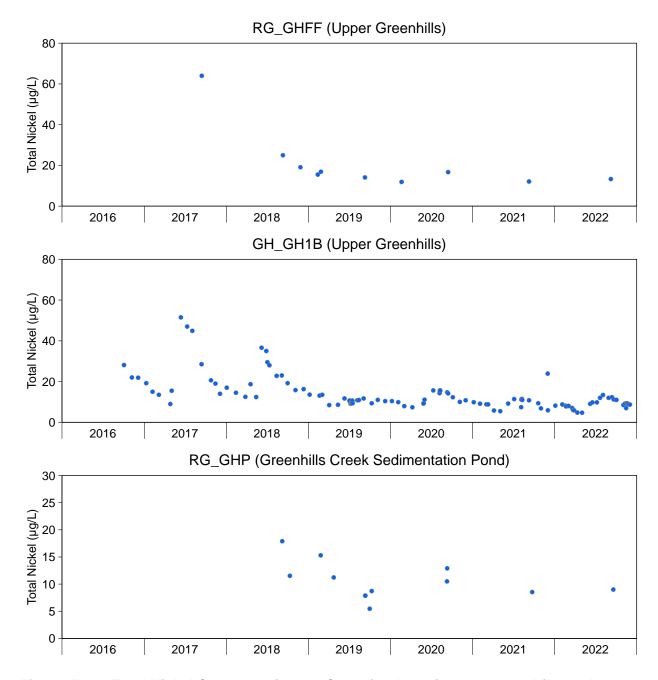


Figure E.11: Total Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

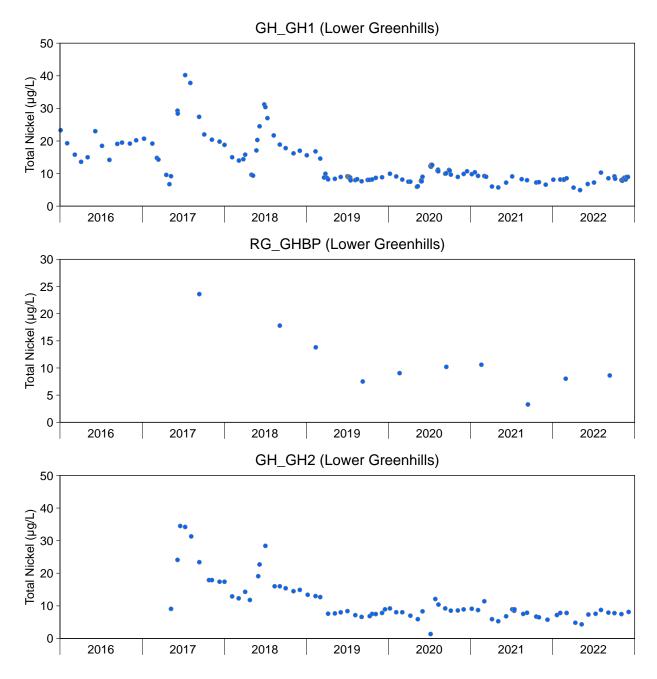


Figure E.11: Total Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

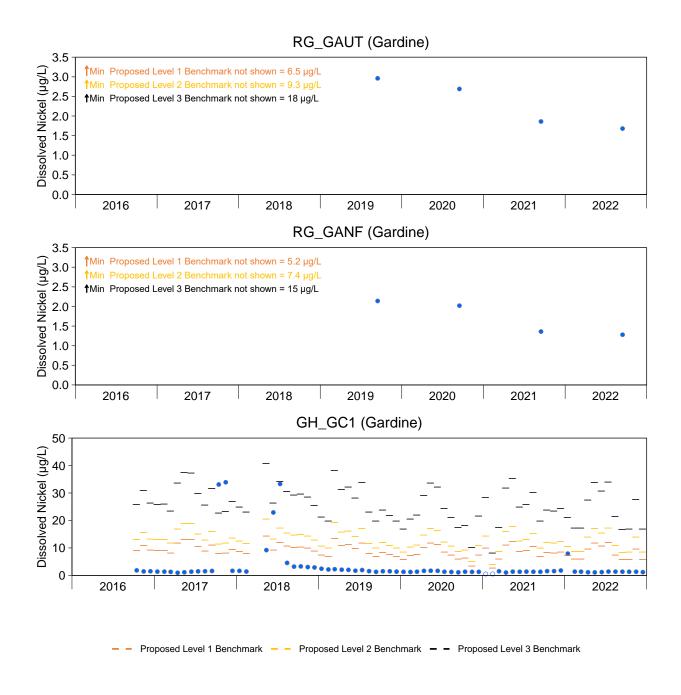


Figure E.12: Dissolved Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

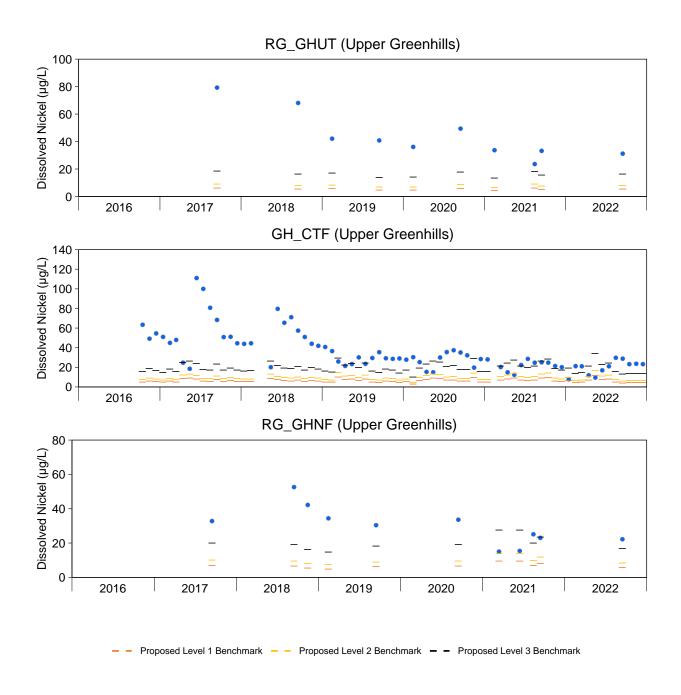


Figure E.12: Dissolved Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

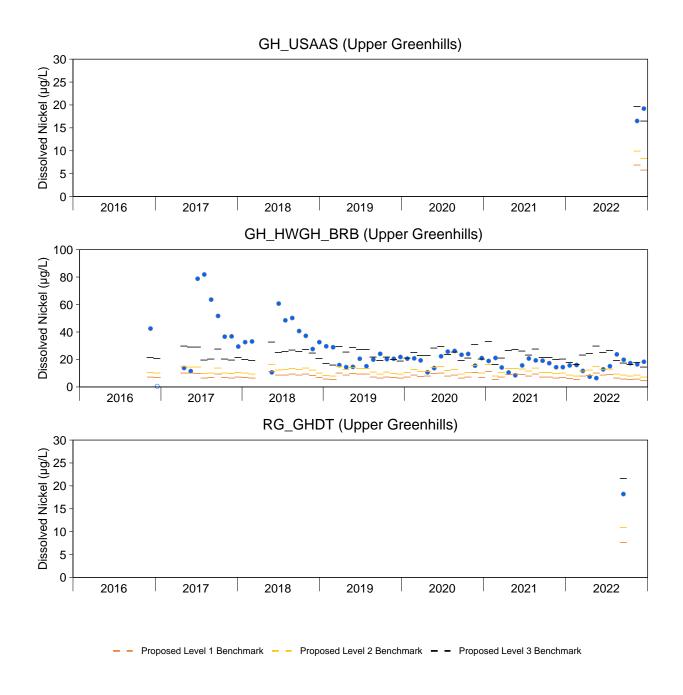


Figure E.12: Dissolved Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

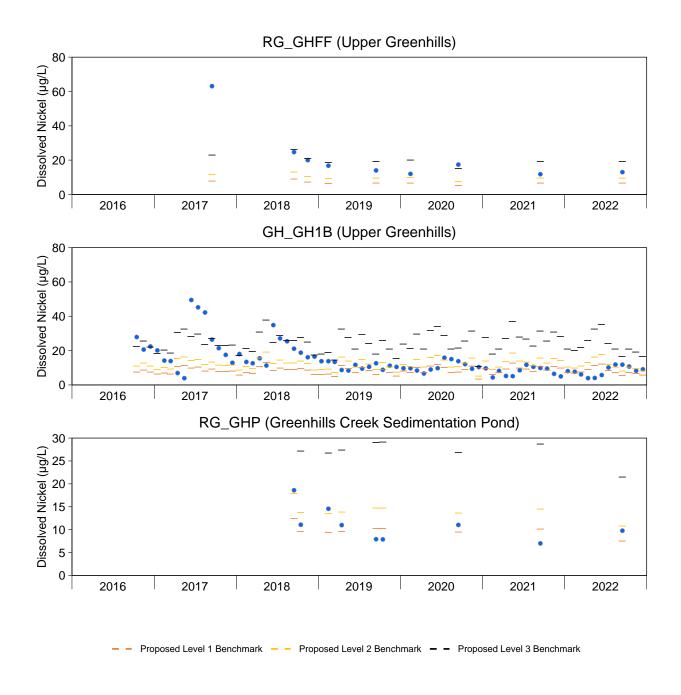


Figure E.12: Dissolved Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

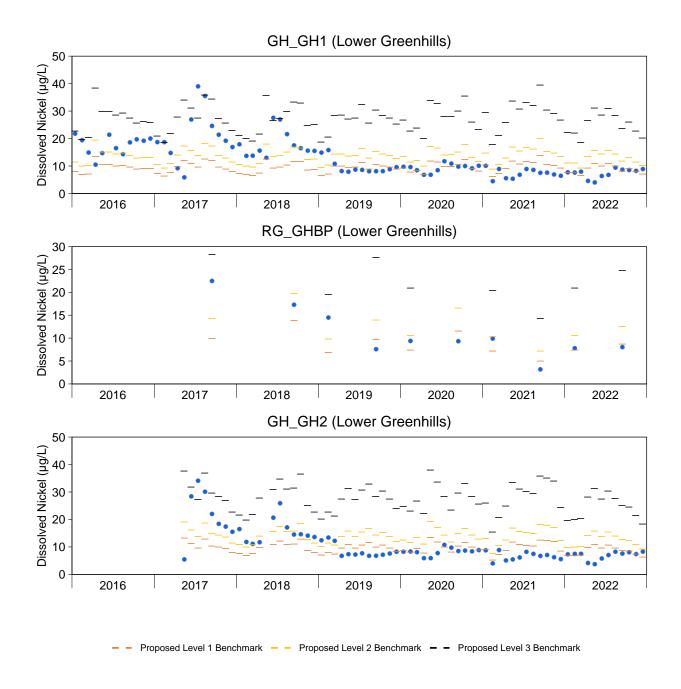


Figure E.12: Dissolved Nickel Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

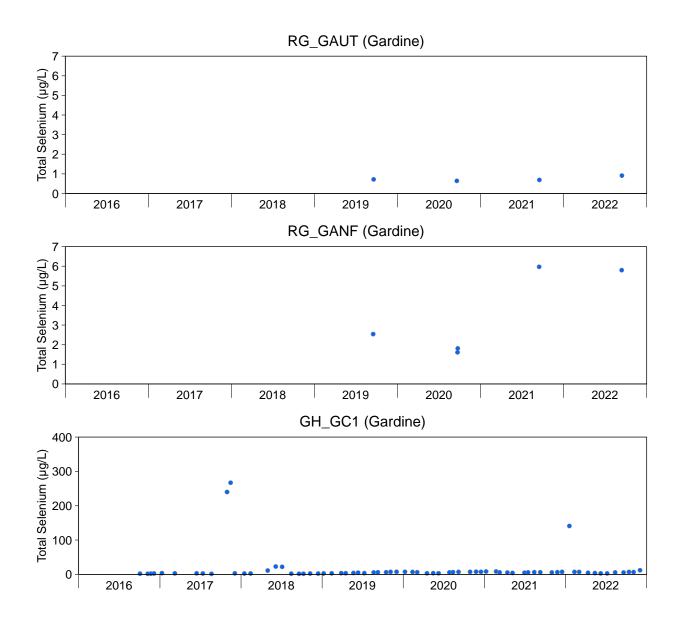


Figure E.13: Total Selenium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

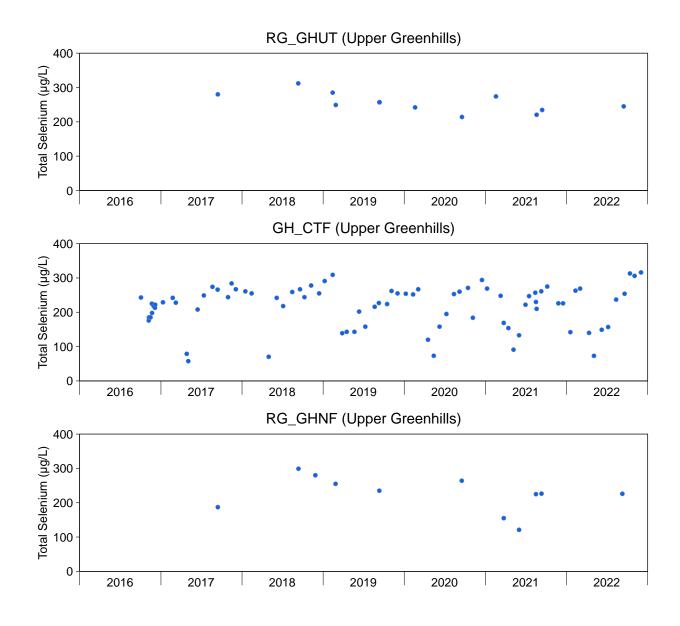


Figure E.13: Total Selenium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

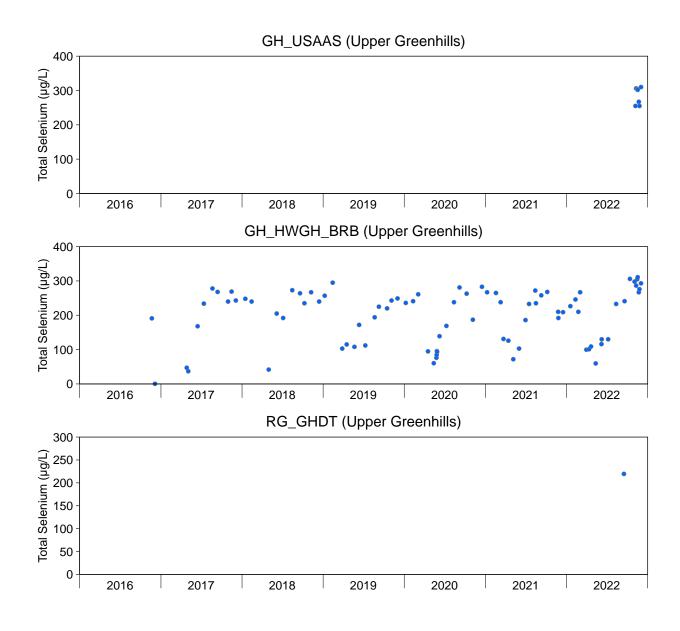


Figure E.13: Total Selenium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

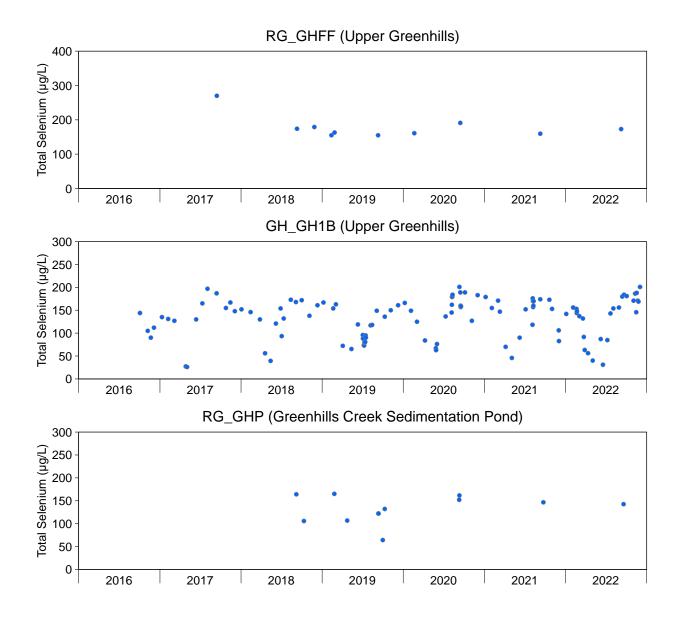


Figure E.13: Total Selenium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

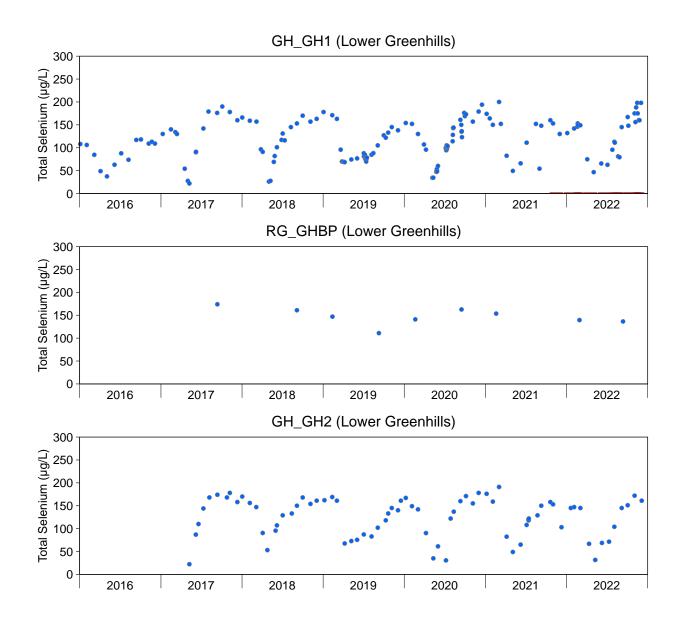


Figure E.13: Total Selenium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

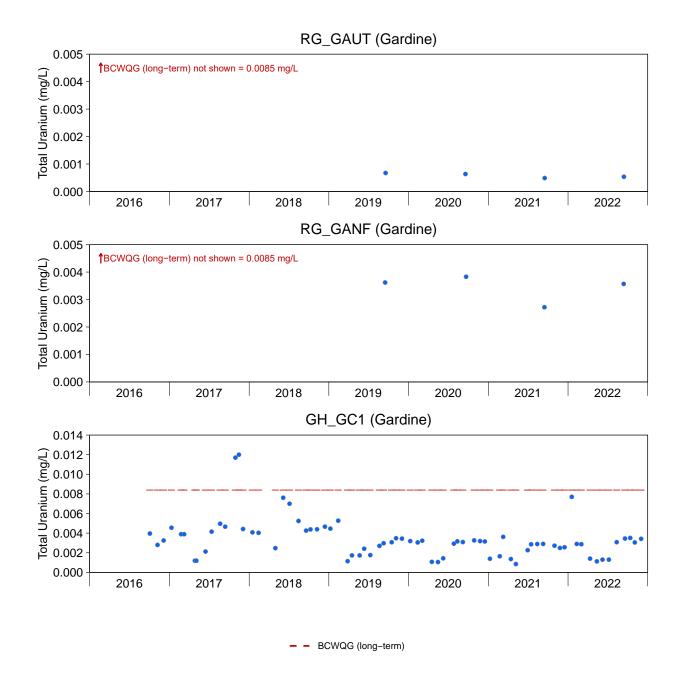


Figure E.14: Total Uranium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

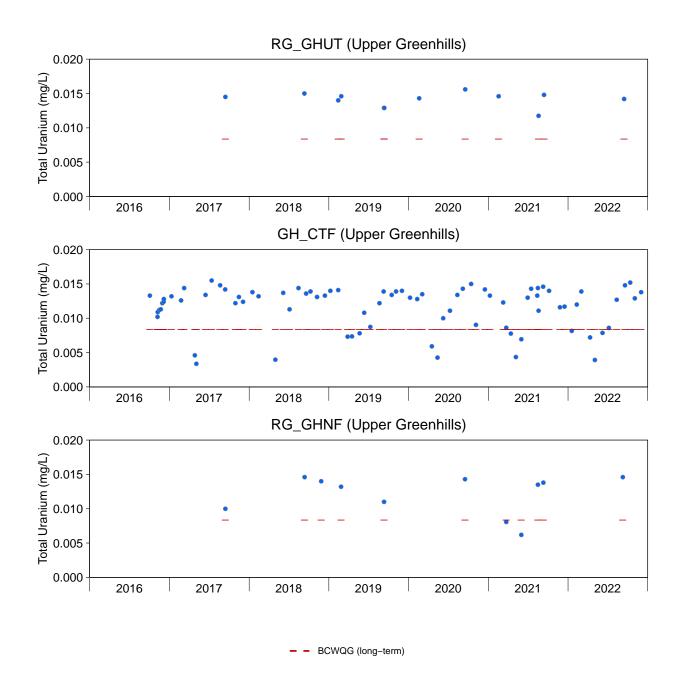


Figure E.14: Total Uranium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

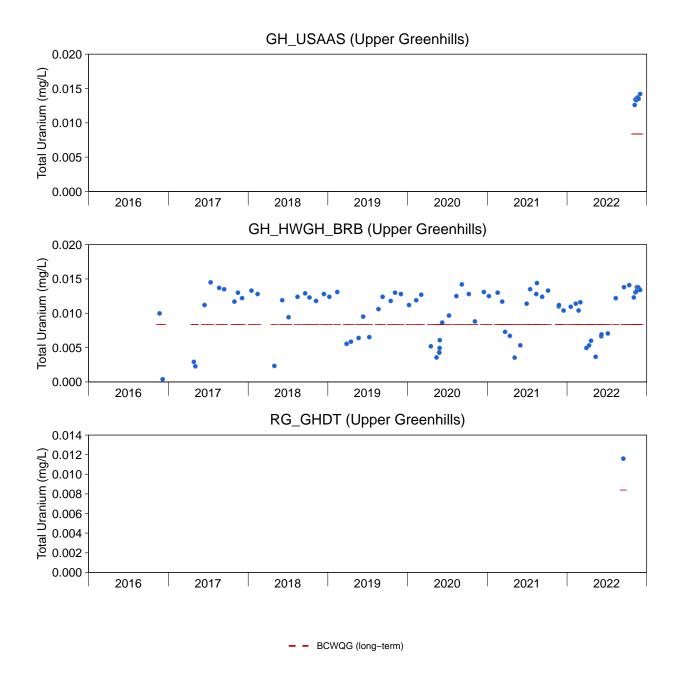


Figure E.14: Total Uranium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

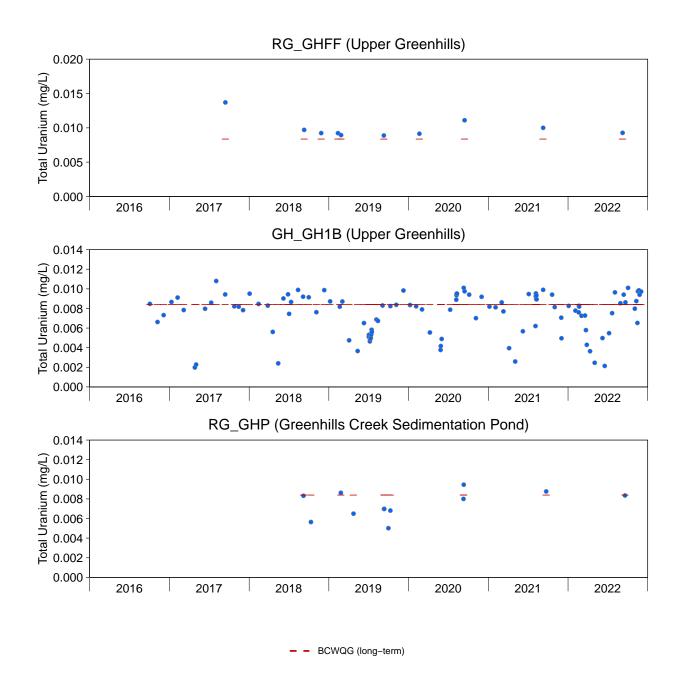


Figure E.14: Total Uranium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

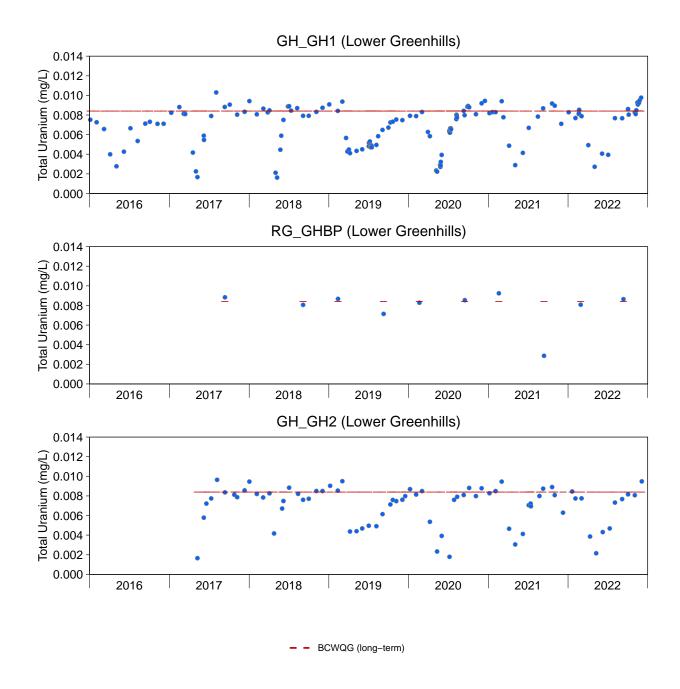


Figure E.14: Total Uranium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

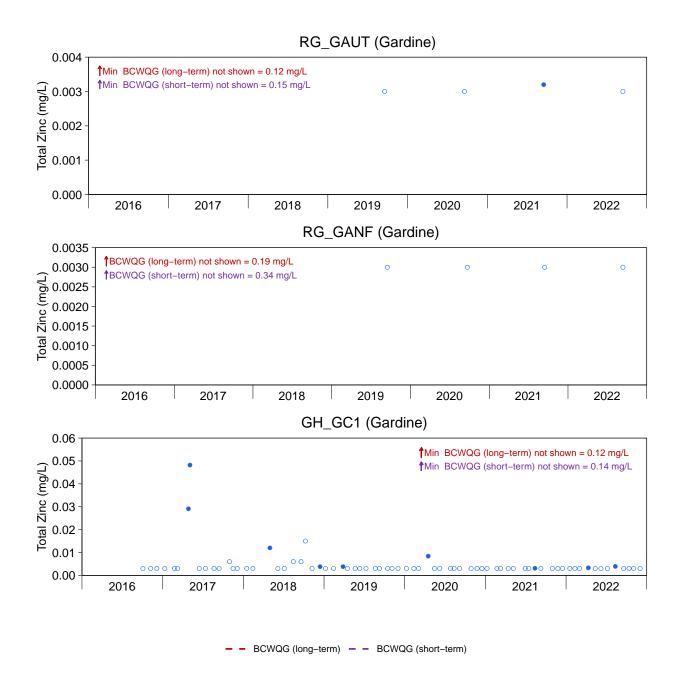


Figure E.15: Total Zinc Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

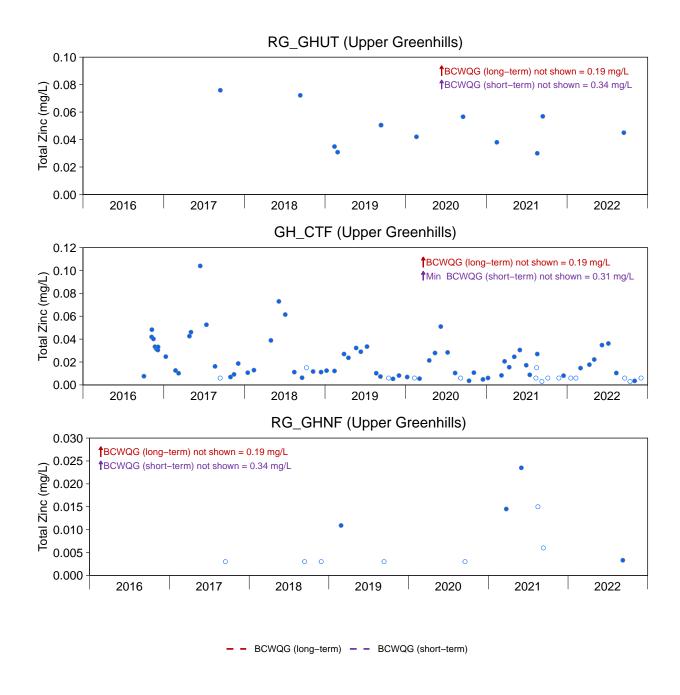


Figure E.15: Total Zinc Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

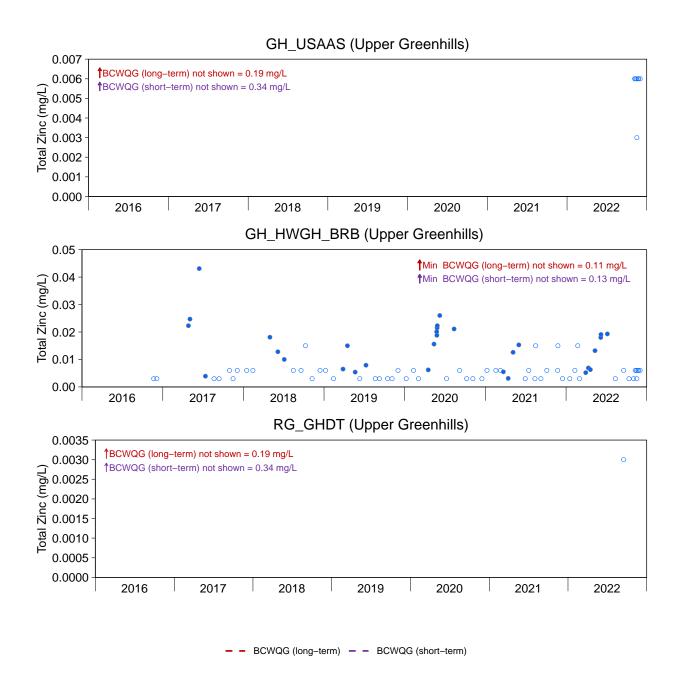


Figure E.15: Total Zinc Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

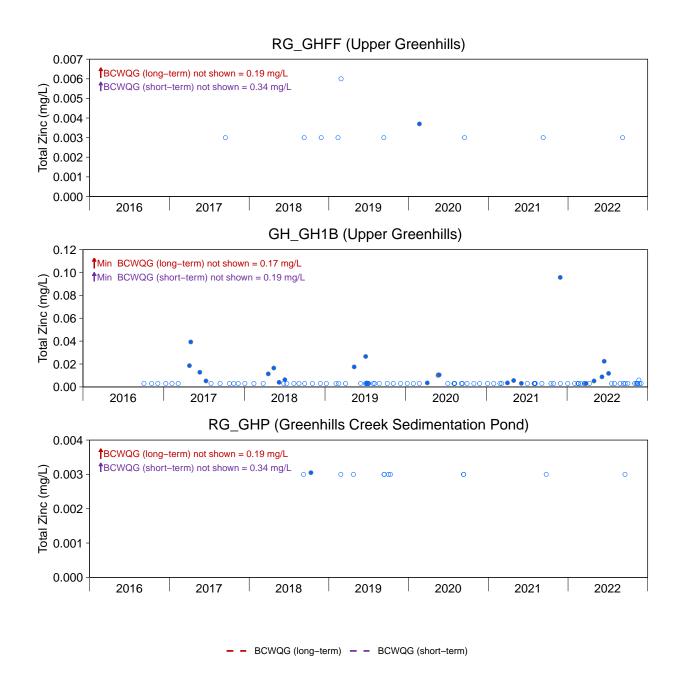


Figure E.15: Total Zinc Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

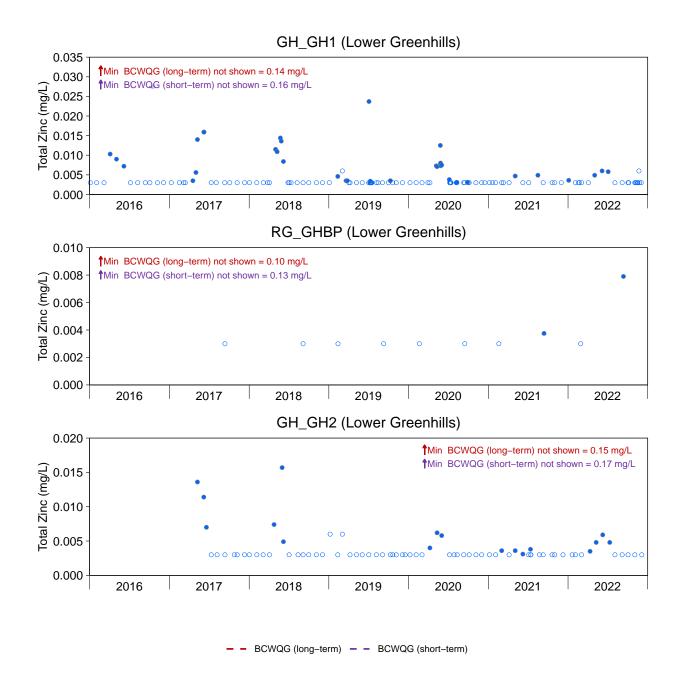


Figure E.15: Total Zinc Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

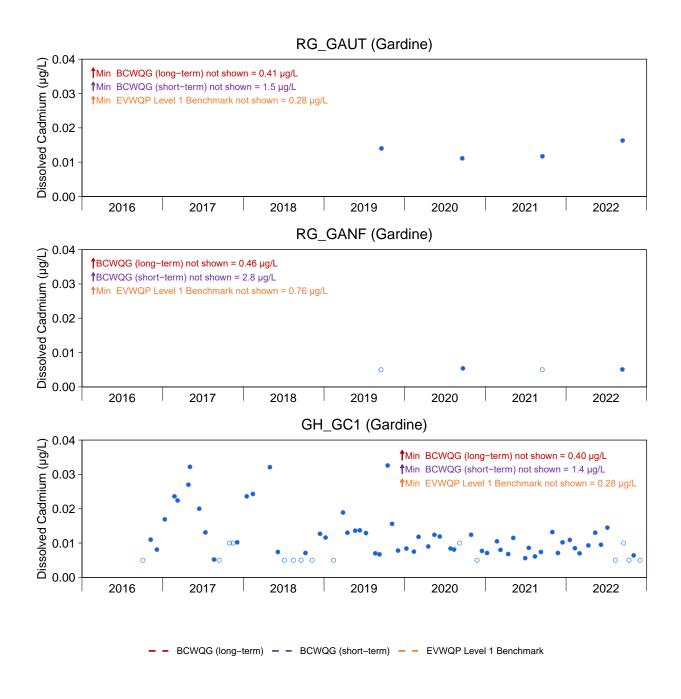


Figure E.16: Dissolved Cadmium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

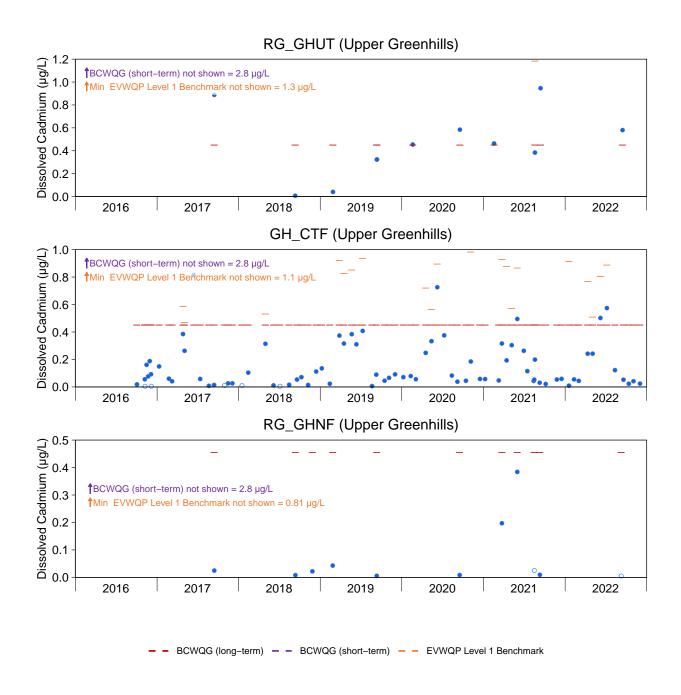


Figure E.16: Dissolved Cadmium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

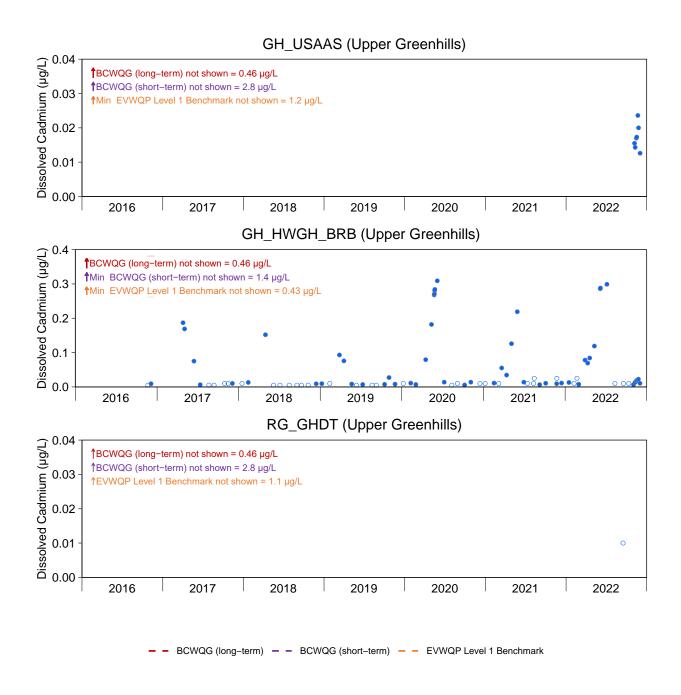


Figure E.16: Dissolved Cadmium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

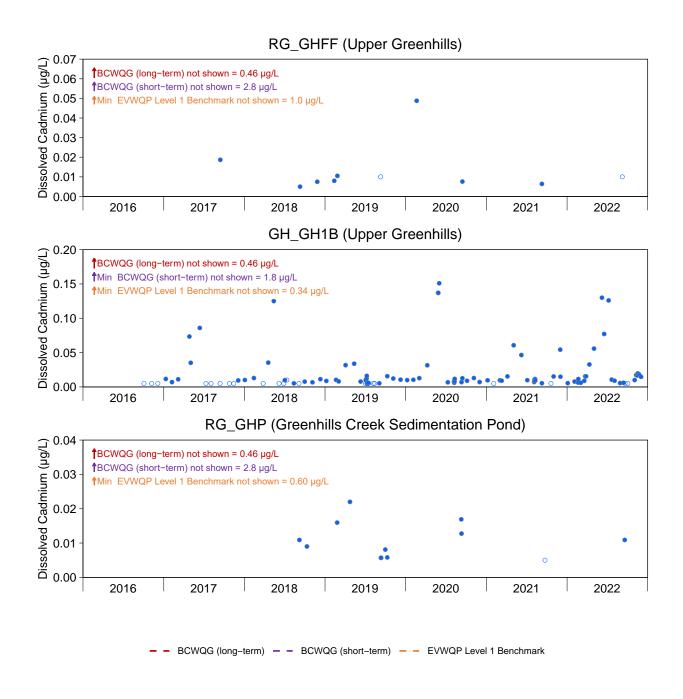


Figure E.16: Dissolved Cadmium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

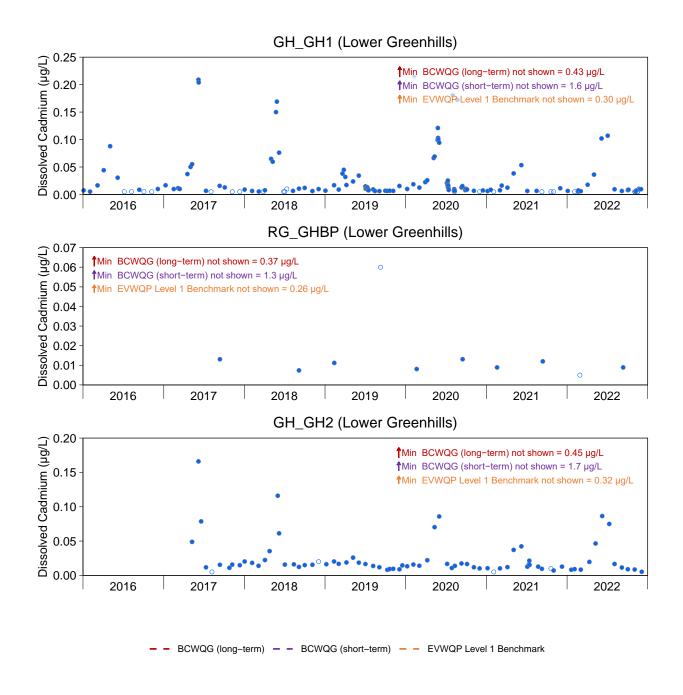


Figure E.16: Dissolved Cadmium Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

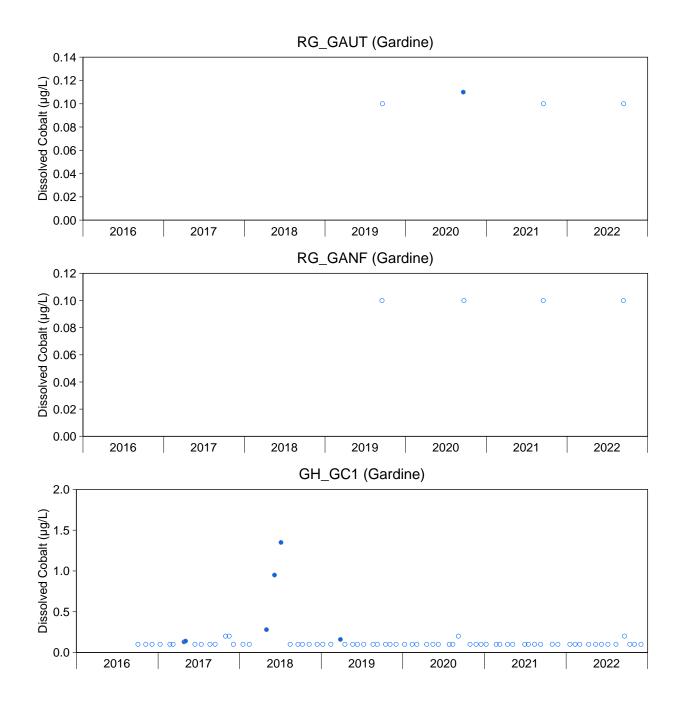


Figure E.17: Dissolved Cobalt Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

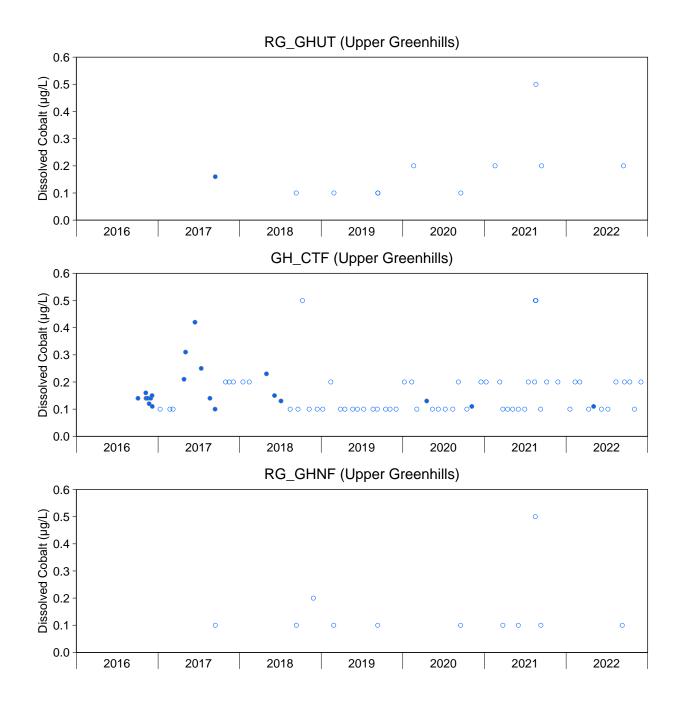


Figure E.17: Dissolved Cobalt Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

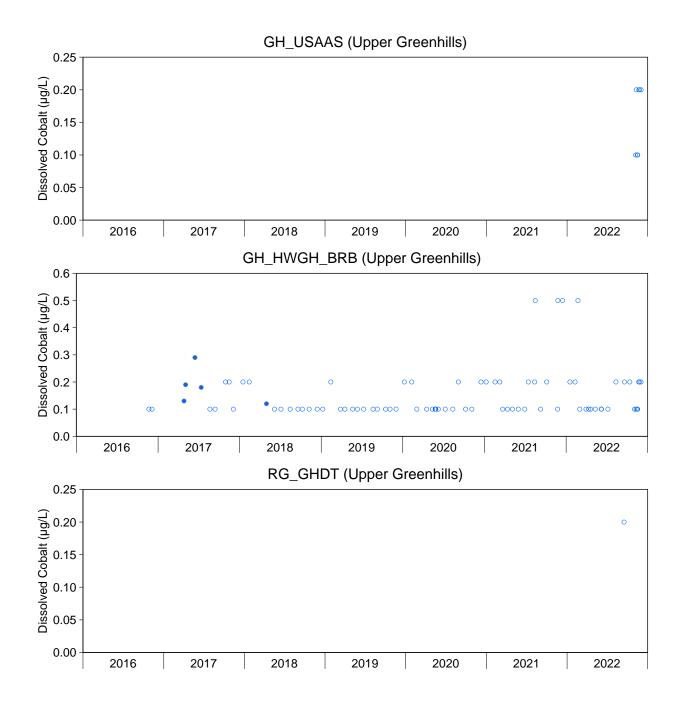


Figure E.17: Dissolved Cobalt Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

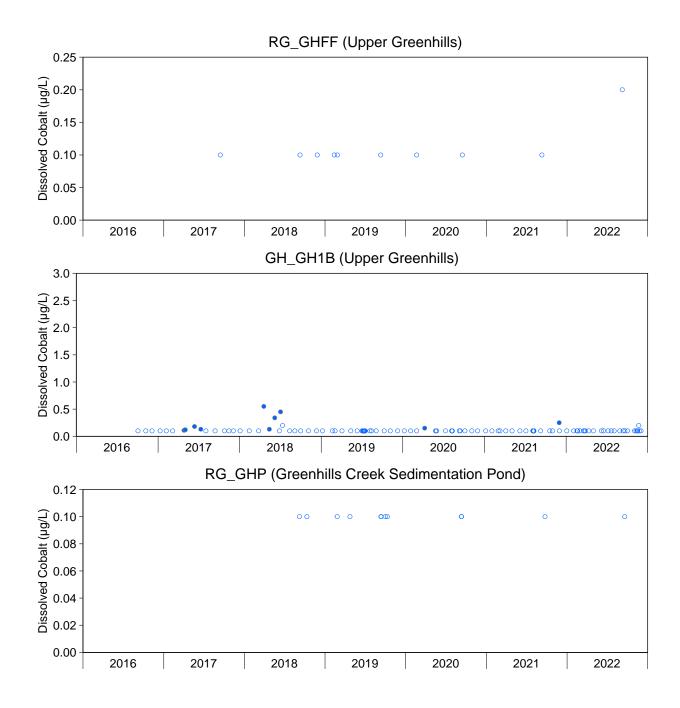


Figure E.17: Dissolved Cobalt Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

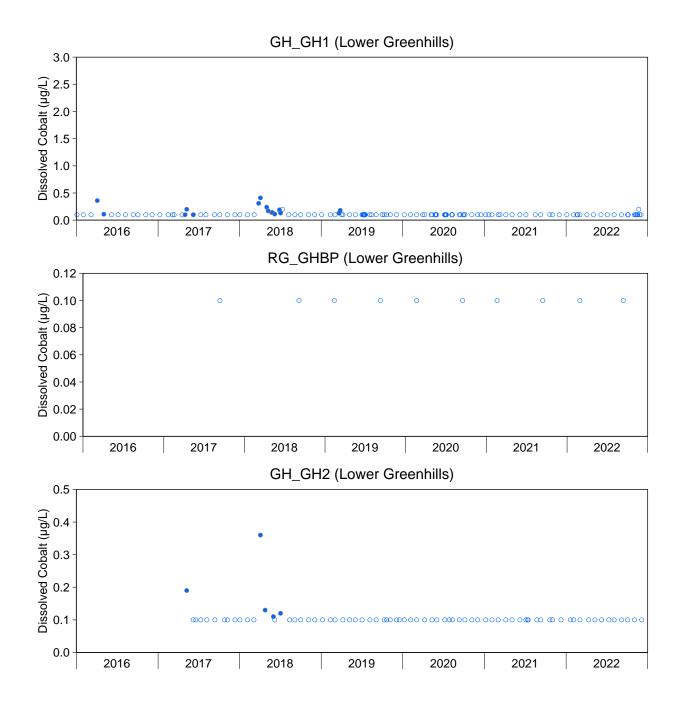


Figure E.17: Dissolved Cobalt Concentrations at Sampling Locations on Greenhills and Gardine Creeks, 2016 to 2022

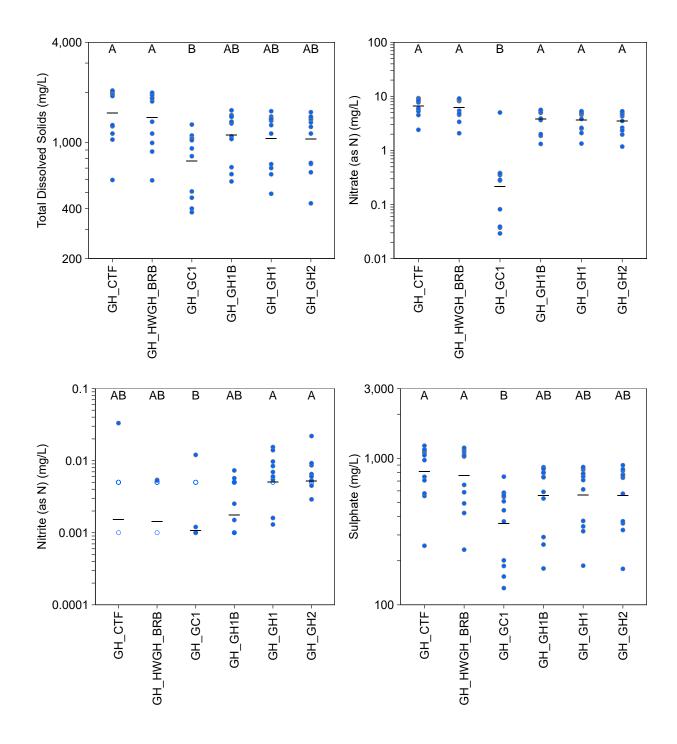


Figure E.18: Comparisons of Monthly Mean Concentrations for Water Quality Constituents in Samples from Routine Monitoring Stations on Greenhills and Gardine Creeks, 2022

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Black dashes represent estimated marginal mean values from a censored regression Analysis of Variance (ANOVA) fit using Maximum Likelihood Estimation with an assumed log-normal distribution. Stations that share a letter (e.g., A,B,C) have concentrations that do not differ significantly (p-value <0.05) for the ANOVA or in a Tukey's Honestly Significant Differences *post hoc* test. Statistics were not conducted for dissolved cobalt because most data were at the LRL.

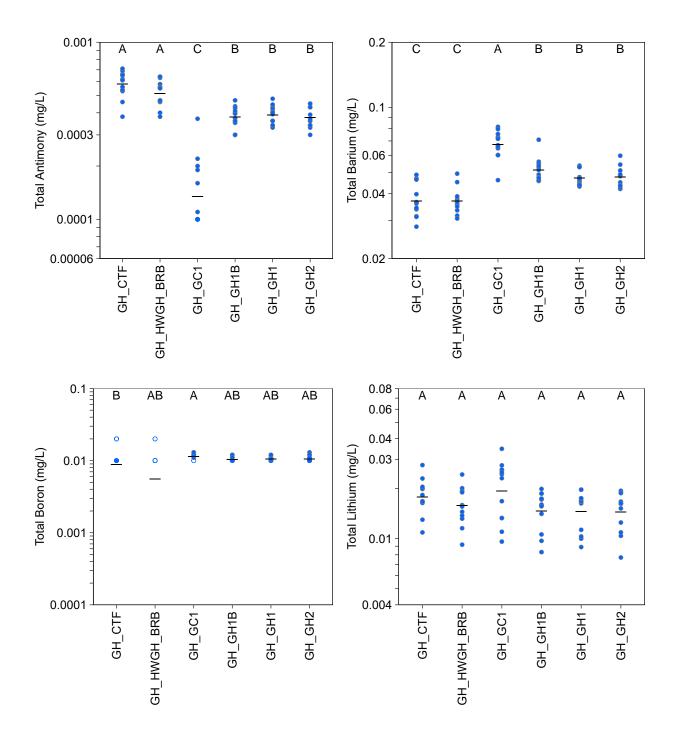


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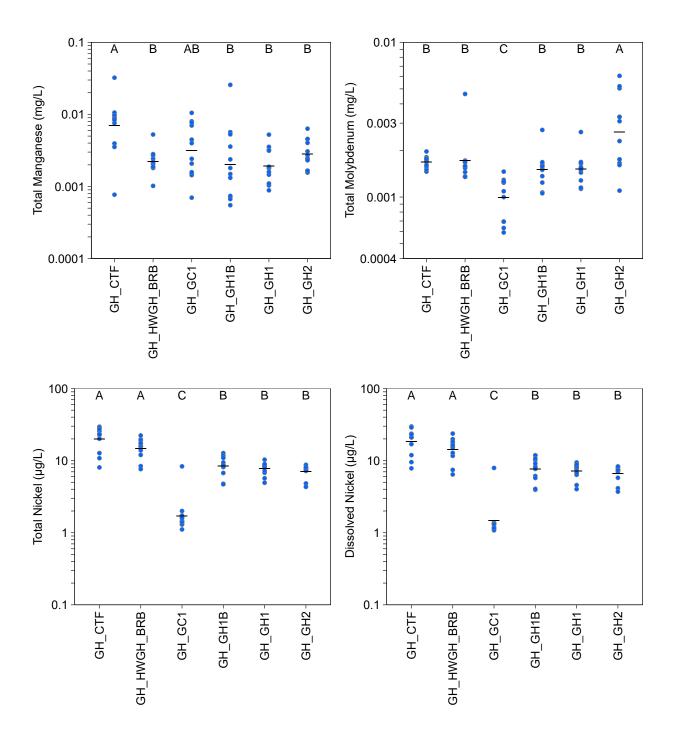


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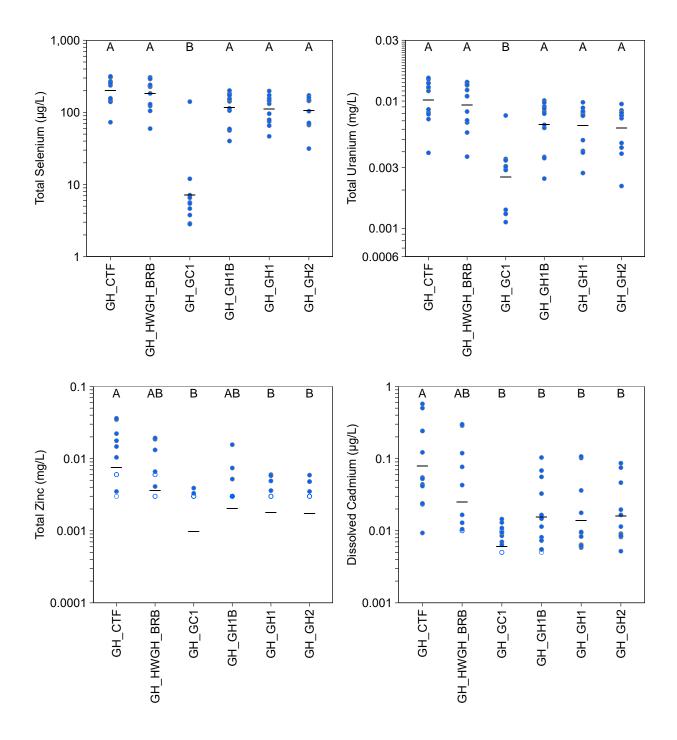


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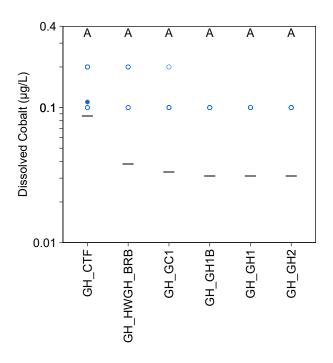


Figure E.18: Comparisons of Monthly Mean Concentrations for Water Quality Constituents in Samples from Routine Monitoring Stations on Greenhills and Gardine Creeks, 2022

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Table E.1: Water Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks and the Greenhills Creek Sedimentation Pond, 2022

Constituent	Units	BC WQG/ CC	ME WQG ^{a,b}	Teck Screening \	/alue/ Benchmark/	Updated EC ^c	Gardin	e Creek		Upper Gree	nhills Creek		Greenhills Creek Sedimentation Pond	Lower G	reenhills eek
		Long-term	Short-term	Lavel 4	Lavel 2	Level 3	RG_GAUT	RG_GANF	RG_GHUT	RG_GHNF	RG_GHDT	RG_GHFF	RG_GHP	RG_0	GHBP
		Average	Maximum	Level 1	Level 2	Level 3	14-Sep-22	13-Sep-22	15-Sep-22	9-Sep-22	16-Sep-22	8-Sep-22	19-Sep-22	28-Feb-22	12-Sep-22
Physical Tests					·						-				
Specific Conductance	μS/cm	-	-	-	-	-	485	1,339	2,203	1,936	2,034	1,592	1,568	1,881	1,482
Hardness (as CaCO ₃ )	mg/L	-	-	-	-	-	243	826	1,500	1,450	1,320	1,230	1,190	1,070	994
рН	рН	6.5 - 9.0	-	-	-	-	7.8	7.9	7.9	7.5	8.2	7.5	8.0	8.1	7.9
Total Suspended Solids	mg/L	-	-	-	-	-	65	1.2	44	15	2.0	5.1	3.4	<1	2.2
Total Dissolved Solids	mg/L	-	-	1,000	-	-	292	1,070	1,920	1,910	1,710	1,450	1,320	1,400	1,400
Turbidity	NTU	-	-	-	-	-	18	0.30	33	1.3	0.14	0.50	1.2	0.48	1.6
Anions and Nutrients															
Alkalinity, Total (as CaCO ₃ )	mg/L	>20	-	-	-	-	222	302	443	400	328	274	253	299	246
Ammonia, Total (as N) ^d	mg/L	0.75 to 1.9	3.9 to 12	-	-	-	<0.005	<0.005	0.013	<0.005	<0.005	<0.005	0.0088	0.022	0.0084
Bromide	mg/L		-	-	-	-	< 0.05	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	< 0.25
Chloride	mg/L	150	600	-	-	-	2.5	2.3	1.6	3.2	1.6	2.2	1.5	2.1	1.8
Fluoride ^e	mg/L	-	1.7 to 1.9	-	-	-	0.13	0.39	<0.1	<0.1	<0.1	0.20	0.15	0.14	0.15
Nitrate (as N)	mg/L	3.0	33	10 to 36	14 to 48	23 to 82	0.036	0.21	8.9	8.6	8.1	6.2	4.6	4.8	4.3
Nitrite (as N) ^f	mg/L	0.020 to 0.040	0.060 to 0.12	-	-	-	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.011	0.010
Total Kjeldahl Nitrogen	mg/L		-	-	-	-	0.097	<0.5	0.68	0.52	<0.5	0.39	<0.5	0.49	1.7
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	-	-	0.014	<0.001	0.0026	<0.001	0.0015	<0.001	0.0018	0.0026	<0.001
Total Phosphorus	mg/L	-	-	-	-	-	0.025	0.0046	0.032	0.029	0.014	0.0052	0.0063	0.0036	0.0034
Sulphate (SO ₄ ) ^e	mg/L	429	-	617	764	1,099	65	576	1,110	1,100	1,080	932	846	776	780
Organic/Inorganic Carbon															
Total Organic Carbon	mg/L	-	-	-	-	-	2.9	1.2	4.6	2.4	1.8	1.4	1.5	1.8	1.7
Dissolved Organic Carbon	mg/L	-	-	-	-	-	2.8	0.97	1.6	1.5	1.9	1.3	1.4	1.6	1.9

Indicates value greater than the long-term average BC WQG (BCMOE 2021a,b; BCMWLRS 2023) or the long-term CCME WQG for total mercury (CCME 2003).

Indicates value greater than the short-term maximum BC WQG (BCMOE 2021a,b).

Indicates value greater than the Level 1 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018). Indicates value greater than the Level 2 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Indicates value greater than the Level 3 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Notes: BC = British Columbia; WQG = Water Quality Guideline; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; EC = Effect Concentration; μS/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; NTU = Nephelometric Turbidity Units; > = greater than; TDS = total dissolved solids; DOC = dissolved organic carbon.

^a Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

^b Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium (BCMOECCS 2021b).

^c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used.

^d Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

^e Hardness-based guidelines, benchmarks, and/or updated EC were calculated based on the hardness of individual water samples.

^f Nitrite guidelines were calculated based on chloride concentrations in individual water samples.

^g Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

^h Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

¹Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table E.1: Water Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks and the Greenhills Creek Sedimentation Pond, 2022

Constituent	Units	BC WQG/ CC	:ME WQG ^{a,b}	Teck Screening \	/alue/ Benchmark	/ Updated EC ^c	Gardin	e Creek		Upper Gree	nhills Creek		Greenhills Creek Sedimentation Pond	Lower Gr	
		Long-term Average	Short-term Maximum	Level 1	Level 2	Level 3					RG_GHDT 16-Sep-22		RG_GHP 19-Sep-22	RG_G 28-Feb-22	
Total Metals		Average	WIGAIIIIGIII				14-3ep-22	13-3ep-22	13-3ep-22	3-3ep-22	10-3ep-22	0-3ep-22	19-3ер-22	20-1 <del>C</del> D-22	12-3ep-22
Aluminum (AI) ^g	mg/L	0.12 to 0.23	-	-	-	-	0.10	0.0070	0.24	0.050	0.0044	0.0070	0.014	0.0045	0.0091
Antimony (Sb)	mg/L	0.0090	•	-	-	-	0.00021	0.00013	0.00078	0.00060	0.00058	0.00046	0.00048	0.00039	0.00047
Arsenic (As)	mg/L	-	0.0050	-	-	-	0.00031	0.00025	0.00036	0.00024	0.00019	0.00025	0.00029	0.00023	0.00028
Barium (Ba)	mg/L	1.0	-	-	-	-	0.13	0.070	0.043	0.036	0.035	0.048	0.046	0.042	0.042
Beryllium (Be)	mg/L	0.00013	-	-	-	-	<0.00002	<0.00002	<0.00004	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Bismuth (Bi)	mg/L	-	-	-	-	-	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Boron (B)	mg/L	1.2	-	-	-	-	0.014	0.016	<0.02	<0.01	<0.01	<0.01	0.012	0.010	0.013
Cadmium (Cd)	mg/L	-	-	-	-	-	0.000028	0.0000075	0.00079	0.000035	0.0000073	0.0000056	0.000012	0.0000083	0.000014
Calcium (Ca)	mg/L	-	-	-	-	-	72	143	303	252	213	209	166	175	157
Chromium (Cr) h	mg/L	0.0010	-	-	-	-	0.00018	0.00014	0.00047	0.00016	<0.0001	0.00014	0.00011	0.00014	0.00016
Cobalt (Co)	mg/L	0.0040	0.11	-	-	-	0.00017	<0.0001	0.00052	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	mg/L	-	-	-	-	-	0.00051	<0.0005	0.0020	0.00052	<0.0005	<0.0005	0.00051	<0.0005	<0.0005
Iron (Fe)	mg/L	-	1.0	-	-	-	0.11	<0.01	0.28	0.10	<0.01	<0.01	0.010	<0.01	<0.01
Lead (Pb) ^e	mg/L	0.013 to 0.020	0.25 to 0.42	-	-	-	0.00011	<0.00005	0.00060	0.00013	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Lithium (Li)	mg/L	-	-	-	-	-	0.0087	0.034	0.021	0.022	0.017	0.021	0.020	0.016	0.020
Magnesium (Mg)	mg/L	-	-	-	-	-	25	112	230	220	208	174	168	147	151
Manganese (Mn)	mg/L	1.7 to 2.6	3.2 to 3.4	-	-	-	0.0072	0.00094	0.022	0.016	0.0016	0.0010	0.0033	0.0032	0.0014
Mercury (Hg)	mg/L	0.000026	-	-	-	-	<0.000005	<0.00005	<0.000005	<0.00005	<0.000005	<0.00005	<0.000005	<0.000005	<0.000005
Molybdenum (Mo)	mg/L	7.6	46	-	-	-	0.00088	0.0012	0.0019	0.0018	0.0015	0.0016	0.0016	0.0016	0.0017
Nickel (Ni)	mg/L	-	-	-	-	-	0.0022	0.0014	0.035	0.025	0.018	0.013	0.0090	0.0080	0.0086
Potassium (K)	mg/L	-	-	-	-	-	1.4	2.8	3.3	2.8	2.8	2.6	2.6	2.4	2.4
Selenium (Se)	mg/L	-	-	-	-	-	0.00086	0.0073	0.26	0.27	0.24	0.20	0.16	0.14	0.15
Silicon (Si)	mg/L	-	-	-	-	-	4.2	3.1	3.7	3.3	3.4	4.0	3.6	3.9	3.5
Silver (Ag) ^e	mg/L	0.0015	0.0030	-	-	-	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Sodium (Na)	mg/L	-	-	-	-	-	3.6	4.6	1.9	2.0	2.0	2.6	2.7	3.2	2.7
Strontium (Sr)	mg/L	-	-	-	-	-	0.24	0.26	0.17	0.17	0.16	0.21	0.20	0.21	0.19
Thallium (TI)	mg/L	0.00080	•	-	-	-	<0.00001	<0.00001	0.000044	0.000019	<0.00001	<0.00001	<0.00001	<0.00001	0.000024
Tin (Sn)	mg/L		•	-	-	-	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	-	-	-	-	-	0.0023	<0.0003	0.0067	0.00079	<0.0003	<0.0003	0.00047	<0.0003	0.00036
Uranium (U)	mg/L	0.0085	-	-	-	-	0.00054	0.0036	0.014	0.015	0.012	0.0093	0.0084	0.0081	0.0086
Vanadium (V)	mg/L	<u> </u>	-	-	-	-	0.00075	<0.0025	0.0012	<0.0005	<0.0005	0.00056	<0.0005	<0.0005	0.00051
Zinc (Zn) ^e	mg/L	0.12 to 0.19	0.15 to 0.34	-	-	-	< 0.003	< 0.003	0.045	0.0033	<0.003	<0.003	< 0.003	< 0.003	0.0079

Indicates value greater than the long-term average BC WQG (BCMOE 2021a,b; BCMWLRS 2023) or the long-term CCME WQG for total mercury (CCME 2003). Indicates value greater than the short-term maximum BC WQG (BCMOE 2021a,b).

Indicates value greater than the Level 1 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Indicates value greater than the Level 2 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).
Indicates value greater than the Level 3 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Notes: BC = British Columbia; WQG = Water Quality Guideline; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; EC = Effect Concentration; µS/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; NTU = Nephelometric Turbidity Units; > = greater than; TDS = total dissolved solids; DOC = dissolved organic carbon.

^a Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

^b Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium (BCMOECCS 2021b).

^c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used.

^d Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

^e Hardness-based guidelines, benchmarks, and/or updated EC were calculated based on the hardness of individual water samples.

^f Nitrite quidelines were calculated based on chloride concentrations in individual water samples.

⁹ Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

^h Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

ⁱ Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table E.1: Water Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks and the Greenhills Creek Sedimentation Pond, 2022

Constituent	Units	BC WQG/ CC	ME WQG ^{a,b}	Teck Screening V	alue/ Benchmark/	Updated EC ^c	Gardin	e Creek		Upper Gree	nhills Creek		Greenhills Creek Sedimentation Pond	Lower G	
		Long-term	Short-term	Level 1	Level 2	Level 3	RG_GAUT	RG_GANF	RG_GHUT	<b>RG_GHNF</b>	RG_GHDT	RG_GHFF	RG_GHP	RG_G	SHBP
		Average	Maximum	Lever	Level 2	Level 3	14-Sep-22	13-Sep-22	15-Sep-22	9-Sep-22	16-Sep-22	8-Sep-22	19-Sep-22	28-Feb-22	12-Sep-22
Dissolved Metals													·		
Aluminum (AI)	mg/L	-	-	-	-	-	0.0036	<0.001	0.0021	<0.001	0.0033	0.0029	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	-	-	-	=	-	0.00015	<0.0001	0.00064	0.00077	0.00057	0.00045	0.00052	0.00034	0.00042
Arsenic (As)	mg/L	-	-	-	-	-	0.00024	0.00015	0.00022	0.00020	<0.0002	<0.0002	0.00025	0.00016	0.00023
Barium (Ba)	mg/L	-	-	-	=	-	0.11	0.074	0.037	0.036	0.038	0.048	0.048	0.041	0.043
Beryllium (Be)	mg/L	-	•	-	-	-	<0.00002	<0.00002	<0.00004	<0.00002	<0.00004	<0.00004	<0.00002	<0.00002	<0.00002
Bismuth (Bi)	mg/L	-	-	-	=	-	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	< 0.00005	<0.00005	<0.00005
Boron (B)	mg/L	-	-	-	=	-	0.010	0.013	< 0.02	<0.01	< 0.02	<0.02	0.011	<0.01	<0.01
Cadmium (Cd) ^e	mg/L	0.00041 to 0.00046	0.0015 to 0.0028	0.00028 to 0.0013	=	-	0.000016	0.0000051	0.00058	<0.00005	<0.00001	<0.00001	0.000011	<0.000005	0.0000089
Calcium (Ca)	mg/L	-	-	-	=	-	62	146	269	249	213	202	178	188	141
Chromium (Cr)	mg/L	-	-	-	=	-	<0.0001	0.00012	< 0.0002	<0.0001	<0.0002	<0.0002	<0.0001	0.00013	<0.0001
Cobalt (Co)	mg/L	-	-	-	=	-	<0.0001	<0.0001	< 0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001
Copper (Cu) i	mg/L	0.00070 to 0.0016	0.0041 to 0.0099	-	=	-	0.00035	<0.0002	0.00052	0.00027	<0.0004	<0.0004	0.00038	<0.0002	0.00042
Iron (Fe)	mg/L	-	0.35	-	=	-	<0.01	<0.01	< 0.02	<0.01	< 0.02	<0.02	<0.01	<0.01	<0.01
Lead (Pb)	mg/L	-	-	-	=	-	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	< 0.00005	<0.00005	<0.00005
Lithium (Li)	mg/L	-	-	-	-	-	0.0085	0.031	0.021	0.017	0.019	0.021	0.019	0.015	0.017
Magnesium (Mg)	mg/L	-	-	-	=	-	21	112	200	201	192	176	181	147	156
Manganese (Mn)	mg/L	-	-	-	-	-	0.0039	0.0011	0.0090	0.0079	0.0015	0.00088	0.0011	0.0019	0.00090
Mercury (Hg)	mg/L	-	-	-	=	-	<0.00005	<0.00005	<0.00005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.00005
Molybdenum (Mo)	mg/L	-	-	-	-	-	0.00073	0.0013	0.0017	0.0019	0.0016	0.0016	0.0016	0.0015	0.0015
Nickel (Ni)	mg/L	-	-	0.0052 to 0.0089	0.0074 to 0.013	0.015 to 0.025	0.0017	0.0013	0.031	0.022	0.018	0.013	0.0098	0.0078	0.0080
Potassium (K)	mg/L	-	-	-	-	-	1.2	2.9	2.9	3.0	2.7	2.5	2.7	2.3	2.4
Selenium (Se)	mg/L	-	-	-	=	-	0.00074	0.0075	0.29	0.27	0.27	0.19	0.16	0.14	0.16
Silicon (Si)	mg/L	-	-	-	-	-	3.6	4.0	2.9	3.3	3.1	3.7	4.4	3.7	3.3
Silver (Ag)	mg/L	-	-	-	=	-	<0.00001	<0.00001	<0.00002	<0.00001	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001
Sodium (Na)	mg/L	-	-	-	-	-	3.2	4.7	1.8	1.9	1.9	2.3	2.7	3.0	2.6
Strontium (Sr)	mg/L	-	-	-	-	-	0.22	0.27	0.16	0.18	0.17	0.20	0.20	0.21	0.17
Thallium (TI)	mg/L	-	-	-	-	-	<0.00001	<0.00001	0.000021	<0.00001	<0.00002	<0.00002	0.000010	<0.00001	<0.00001
Tin (Sn)	mg/L	-	-	-	-	-	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	-	-	-	-	-	< 0.0003	<0.0003	<0.0006	< 0.0003	<0.0006	<0.0006	<0.0003	<0.0003	<0.0003
Uranium (U)	mg/L	-	-	-	-	-	0.00048	0.0036	0.012	0.014	0.011	0.0093	0.0084	0.0074	0.0073
Vanadium (V)	mg/L	-	-	-	-	-	<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg/L	-	-		-	-	0.0012	<0.001	0.033	<0.001	<0.002	<0.002	<0.001	<0.001	0.0010

Indicates value greater than the long-term average BC WQG (BCMOE 2021a,b; BCMWLRS 2023) or the long-term CCME WQG for total mercury (CCME 2003). Indicates value greater than the short-term maximum BC WQG (BCMOE 2021a.b).

Indicates value greater than the Level 1 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Indicates value greater than the Level 2 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Indicates value greater than the Level 3 Elk Valley Water Quality Plan Benchmark (dissolved cadmium), Screening Value (TDS), Updated Effects Concentration (sulphate and nitrate) or Proposed Benchmark (dissolved nickel) (Golder 2022a,b; Teck 2014, 2018).

Notes: BC = British Columbia; WQG = Water Quality Guideline; CCME = Canadian Council of Ministers of the Environment; Teck = Teck Coal Limited; EC = Effect Concentration;  $\mu$ S/cm = microSiemens per centimetre; - = no data/not applicable; CaCO₃ = calcium carbonate; mg/L = milligrams per litre; NTU = Nephelometric Turbidity Units; > = greater than; TDS = total dissolved solids; DOC = dissolved organic carbon.

^a Approved (BCMOECCS 2021a), working (BCMOECCS 2021b), and updated aluminum (BCMWLRS 2023) BC WQG for the protection of freshwater aquatic life or the long-term CCME mercury WQG (CCME 2003) for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data.

^b Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium (BCMOECCS 2021b).

^c Where more than one screening value, benchmark, or updated EC was applicable, the most conservative (lowest) value was used.

^d Ammonia guidelines were calculated based on the temperature and pH of individual water samples.

^e Hardness-based quidelines, benchmarks, and/or updated EC were calculated based on the hardness of individual water samples.

^f Nitrite guidelines were calculated based on chloride concentrations in individual water samples.

⁹ Total aluminum guidelines were calculated based on the pH, DOC, and hardness of individual water samples (BCMWLRS 2023).

^h Guideline for chromium VI (0.001 mg/L) was selected because this is the principal species found in surface waters.

ⁱ Dissolved copper guidelines were calculated based on the Biotic Ligand Model (BCMOECCS 2021a).

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

Watercourse	Station	Summary Statistic	Total Dissolved Solids (mg/L) ^a	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)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Aluminum (mg/L)	Total Antimony (mg/L)
		n	12	12	12	12	12	12	12	12	12	12	12	12	12
		Annual Minimum	380	8.2	8.0	9.3	176	0.029	<0.0010	<0.0050	130	1.4	0.11	0.0044	0.00010
		Annual Maximum	1,280	8.7	8.7	12	309	5.0	0.012	0.011	750	4.1	0.53	0.26	0.00037
		Annual Mean	840	8.3	8.3	11	268	0.64	0.0020	0.0063	417	2.4	0.29	0.061	0.00015
		Annual Median	975	8.3	8.3	12	290	0.32	0.0010	0.0050	476	2.4	0.27	0.017	0.00010
<b>Gardine Creek</b>	GH_GC1	% <lrl< td=""><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>75%</td><td>67%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>33%</td></lrl<>	0%	0%	0%	0%	0%	0%	75%	67%	0%	0%	0%	0%	33%
	_	% >BC or CCME WQG b	-	-	0%	0%	0%	8.3%	0%	0%	58%	0%	-	0%	0%
		% >BCWQG °	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	-
		% >Level 1 Benchmark/updated EC	50%	-	-	-	-	0%	-	-	8.3%	-	-	-	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	0%	-	-	-	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	0%	-	-	0%	-	-	-	-
		n	12	12	12	12	12	12	12	12	12	12	12	12	12
		Annual Minimum	594	8.1	7.9	7.7	226	2.4	<0.0010	<0.0050	253	0.46	0.078	0.0039	0.00038
		Annual Maximum	2,050	8.6	8.7	12	443	9.3	0.033	0.016	1,220	2.0	0.12	0.22	0.00071
		Annual Mean	1,602	8.2	8.2	11	373	7.1	0.0037	0.0065	880	1.5	0.084	0.045	0.00059
		Annual Median	1,920	8.2	8.1	11	409	8.0	0.0050	0.0050	1,012	1.5	0.078	0.014	0.00062
	GH_CTF	% <lrl< td=""><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>92%</td><td>75%</td><td>0%</td><td>0%</td><td>75%</td><td>8.3%</td><td>0%</td></lrl<>	0%	0%	0%	0%	0%	0%	92%	75%	0%	0%	75%	8.3%	0%
	_	% >BC or CCME WQG b	-	-	0%	8.3%	0%	92%	8.3%	0%	92%	0%	-	8.3%	0%
		% >BCWQG °	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	-
		% >Level 1 Benchmark/updated EC	92%	-	-	-	-	0%	-	-	75%	-	-	-	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	58%	-	-	-	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	0%	_	-	33%	-	-	-	-
		n	21	21	29	28	30	21	21	21	21	21	21	21	21
		Annual Minimum	591	8.2	8.0	9.8	207	2.1	<0.0010	<0.0050	238	0.43	0.071	< 0.003	0.00036
		Annual Maximum	2,090	8.7	8.8	12	460	9.1	0.0054	0.013	1,200	4.1	0.13	0.05	0.00064
		Annual Mean	1,560	8.3	8.2	11	338	7.0	0.0014	0.0061	882	1.5	0.074	0.013	0.00052
Upper		Annual Median	1,810	8.3	8.2	11	346	8.6	0.0050	0.0050	1,050	1.6	0.071	0.0078	0.00055
Greenhills	GH_HWGH_BRB	% <lrl< td=""><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>90%</td><td>67%</td><td>0%</td><td>0%</td><td>90%</td><td>38%</td><td>0%</td></lrl<>	0%	0%	0%	0%	0%	0%	90%	67%	0%	0%	90%	38%	0%
Creek		% >BC or CCME WQG b	-	-	0%	0%	0%	95%	0%	0%	86%	0%	-	0%	0%
		% >BCWQG °	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	-
		% >Level 1 Benchmark/updated EC	71%	-	-	-	-	0%	-	-	67%	-	-	-	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	67%	-	-	-	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	0%	_	-	43%	-	-	-	-
		n	27	27	36	36	35	27	27	27	27	27	27	27	27
		Annual Minimum	392	7.1	8.2	9.6	171	1.2	<0.0010	< 0.0050	141	0.60	0.088	< 0.003	0.00030
		Annual Maximum	1,600	8.5	8.8	15	352	5.7	0.0096	0.026	870	3.4	0.22	0.79	0.00049
		Annual Mean	1,219	8.3	8.4	12	290	4.4	0.0020	0.0063	665	1.8	0.16	0.056	0.00038
		Annual Median	1,340	8.4	8.4	12	295	5.0	0.0050	0.0050	748	1.8	0.15	0.011	0.00037
	GH_GH1B	% <lrl< td=""><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>78%</td><td>74%</td><td>0%</td><td>0%</td><td>0%</td><td>7%</td><td>0%</td></lrl<>	0%	0%	0%	0%	0%	0%	78%	74%	0%	0%	0%	7%	0%
		% >BC or CCME WQG b	-	-	0%	0%	0%	78%	0%	0%	81%	0%	-	3.7%	0%
		% >BCWQG °	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	-
		% >Level 1 Benchmark/updated EC	78%	-	-	-	-	0%	-	-	67%	-	-	-	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	44%	-	-	-	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	0%	-	-	0%	-	-	-	-

>50% of samples exceed the guideline or benchmark.

>95% of samples exceed the guideline or benchmark.

^a Screening values are applied to total dissolved solids concentrations, rather than Benchmarks/updated EC.

b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

rse Station Summary Statistic	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)	(mg/L)	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	(mg/L)
n	12	12	12	12	12	12	12	12	12	12	12	12
Annual Minimum	0.00016	0.046	<0.000020	<0.010	<0.00010	<0.00010	<0.010	<0.000050	0.0096	0.00070	<0.0000050	0.00059
Annual Maximum	0.00052	0.081	0.000023	0.013	0.00035	0.00025	0.31	0.00028	0.035	0.010	0.0000015	0.0015
Annual Mean	0.00026	0.068	0.000020	0.012	0.00019	0.00012	0.085	0.000087	0.021	0.0043	0.00000077	0.0010
Annual Median	0.00022	0.069	0.000020	0.012	0.00016	0.00010	0.030	0.000050	0.024	0.0032	0.00000056	0.0012
reek GH_GC1 % <lrl< th=""><td>0%</td><td>0%</td><td>92%</td><td>25%</td><td>17%</td><td>75%</td><td>33%</td><td>58%</td><td>0%</td><td>0%</td><td>83%</td><td>0%</td></lrl<>	0%	0%	92%	25%	17%	75%	33%	58%	0%	0%	83%	0%
% >BC or CCME WQG b	-	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%
% >BCWQG °	0%	-	-	-	-	0%	0%	0%	-	0%	-	0%
% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
% >Level 3 Benchmark/updated EC	-	-		-	-	-	-	-	_	-	-	-
n	12	12	12	12	12	12	12	12	12	12	12	12
Annual Minimum	0.00017	0.028	<0.000020	<0.010	0.00011	<0.00010	<0.010	<0.000050	0.011	0.00077	<0.0000050	0.0015
Annual Maximum	0.00031	0.049	<0.000020	0.010	0.00046	0.00025	0.26	0.00022	0.028	0.032	0.0000025	0.0020
Annual Mean	0.00024	0.037	<0.000020	0.010	0.00019	0.00014	0.056	0.000086	0.018	0.0094	0.0000012	0.0017
Annual Median	0.00023	0.036	<0.000020	0.010	0.00015	0.00020000	0.015	0.00010	0.018	0.0088	0.00000082	0.0017
GH_CTF % <lrl< th=""><td>8.3%</td><td>0%</td><td>100%</td><td>92%</td><td>33%</td><td>75%</td><td>50%</td><td>67%</td><td>0%</td><td>0%</td><td>75%</td><td>0%</td></lrl<>	8.3%	0%	100%	92%	33%	75%	50%	67%	0%	0%	75%	0%
% >BC or CCME WQG b	-	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%
% >BCWQG °	0%	-	-	-	-	0%	0%	0%	-	0%	-	0%
% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
n	21	21	21	21	21	21	21	21	21	21	21	21
Annual Minimum	0.00017	0.030	<0.000020	<0.010	0.00010	<0.00010	< 0.010	< 0.000050	0.0092	0.00088	< 0.00000050	0.0013
Annual Maximum	0.00027	0.049	<0.00010	<0.010	0.00035	0.00014	0.060	0.000097	0.024	0.0053	0.00000090	0.0086
Annual Mean	0.00021	0.037	<0.000020	<0.010	0.00017	0.00010	0.018	0.000055	0.017	0.0024	0.00000060	0.0024
Annual Median	0.00022	0.037	< 0.000020	< 0.010	0.00013	0.00010	0.020	0.000050	0.017	0.0021	0.0000050	0.0016
Is GH_HWGH_BRB % <lrl< th=""><td>24%</td><td>0%</td><td>100%</td><td>100%</td><td>38%</td><td>95%</td><td>67%</td><td>90%</td><td>0%</td><td>0%</td><td>95%</td><td>0%</td></lrl<>	24%	0%	100%	100%	38%	95%	67%	90%	0%	0%	95%	0%
% >BC WQG ^b	_	0%	0%	0%	4.8%	0%	-	0%	-	0%	0%	0%
% >BCWQG °	0%	_	-	-	-	0%	0%	0%	_	0%	-	0%
% >Level 1 Benchmark/updated EC	-	_	-	_	_	-	-	-	_	-	-	-
% >Level 2 Benchmark/updated EC	_	_	-	_	_	-	_	_	_	-	-	-
% >Level 3 Benchmark/updated EC	_	_	-	_	_	-	_	_	_	-	-	-
n	27	27	27	27	27	27	27	27	27	27	27	27
Annual Minimum	0.00014	0.040	<0.000020	<0.010	0.00010	<0.00010	<0.010	< 0.000050	0.0082	0.00046	<0.0000050	0.00092
Annual Maximum	0.00076	0.084	0.000095	0.012	0.0013	0.0012	1.1	0.0016	0.020	0.049	0.000010	0.0050
Annual Mean	0.00023	0.052	0.000023	0.011	0.00024	0.00015	0.072	0.00012	0.016	0.0040	0.0000013	0.0017
Annual Median	0.00022	0.051	0.000020	0.010	0.00015	0.00010	0.010	0.000050	0.016	0.0015	0.0000050	0.0016
GH_GH1B % <lrl< th=""><td>3.7%</td><td>0%</td><td>96%</td><td>41%</td><td>7.4%</td><td>85%</td><td>56%</td><td>70%</td><td>0%</td><td>0%</td><td>78%</td><td>0%</td></lrl<>	3.7%	0%	96%	41%	7.4%	85%	56%	70%	0%	0%	78%	0%
% >BC or CCME WQG b	-	0%	0%	0%	7.4%	0%	-	0%	-	0%	0%	0%
% >BCWQG °	0%	-	-	-	-	0%	3.7%	0%	_	0%	-	0%
% >Level 1 Benchmark/updated EC	-	_	_	_	_	-	-	-	_	-	_	-
% >Level 2 Benchmark/updated EC	_	_	_	-	_	_	_	_	_	_	_	_
% >Level 3 Benchmark/updated EC	_	_	_	_	_	_	_	_	_	_	_	_
% >Level 2 Bo	enchmark/updated EC	enchmark/updated EC -	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC	enchmark/updated EC

>50% of samples exceed the guideline or benchmark.

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^a Screening values are applied to total dissolved solids concentrations, rather than Benchmarks/updated EC.

b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

Watercourse	Station	Summary Statistic	Total Nickel (mg/L)	Total Selenium (mg/L)	Total Silver (mg/L)	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Cadmium (mg/L)	Dissolved Cobalt (mg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)	Dissolved Nickel (mg/L)
		n	12	12	12	12	12	12	12	12	12	12	12
		Annual Minimum	0.0011	0.0028	<0.000010	<0.000010	0.0011	< 0.0030	< 0.0000050	<0.00010	<0.00020	< 0.010	0.011
		Annual Maximum	0.0083	0.141	0.000011	0.000011	0.0077	0.0039	0.000014	<0.00010	0.00053	0.018	0.0079
		Annual Mean	0.0021	0.017	0.000010	0.000010	0.0029	0.0031	0.0000084	<0.00010	0.00029	0.011	0.0018
		Annual Median	0.0014	0.0061	0.000010	0.000010	0.0030	0.0030	0.0000085	<0.00010	0.00024	0.010	0.0013
<b>Gardine Creek</b>	GH_GC1	% <lrl< th=""><th>0%</th><th>0%</th><th>83%</th><th>92%</th><th>0%</th><th>83%</th><th>33%</th><th>100%</th><th>42%</th><th>75%</th><th>0%</th></lrl<>	0%	0%	83%	92%	0%	83%	33%	100%	42%	75%	0%
		% >BC or CCME WQG b	-	-	0%	0%	0%	0%	0%	-	0%	-	-
		% >BCWQG °	-	-	0%	-	-	0%	0%	-	0%	0%	-
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	8.3%
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	0%
		% >Level 3 Benchmark/updated EC	_	-	-			<u>-</u>	-		_	-	0%
		n	12	12	12	12	12	12	12	12	12	12	12
		Annual Minimum	0.0080	0.073	<0.000010	0.000011	0.0039	<0.0030	0.0000093	<0.00010	0.00020	<0.010	0.0078
		Annual Maximum	0.030	0.316	<0.000010	0.000025	0.015	0.036	0.00057	0.00011	0.00066	<0.010	0.030
		Annual Mean	0.021	0.218	<0.000010	0.000016	0.011	0.013	0.00016	0.00010	0.00040	< 0.010	0.020
		Annual Median	0.023	0.246	<0.000010	0.000014	0.012	0.0070	0.000054	0.00020	0.00039	<0.010	0.021
	GH_CTF	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>25%</th><th>0%</th><th>42%</th><th>0%</th><th>92%</th><th>50%</th><th>100%</th><th>0%</th></lrl<>	0%	0%	100%	25%	0%	42%	0%	92%	50%	100%	0%
		% >BC or CCME WQG b	-	-	0%	0%	67%	0%	17%	-	0%	-	-
		% >BCWQG ^c	-	-	0%	-	-	0%	0%	-	0%	0%	-
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	92%
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	83%
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	58%
		n	21	21	21	21	21	21	21	21	21	21	12
		Annual Minimum	0.0076	0.060	<0.000010	<0.000010	0.0037	<0.0030	0.0000066	<0.00010	0.00020	<0.010	0.0064
		Annual Maximum	0.022	0.311	<0.000010	0.000011	0.014	0.019	0.00030	<0.00010	0.00097	<0.010	0.024
		Annual Mean	0.015	0.215	<0.000010	0.000010	0.010	0.0064	0.000066	<0.00010	0.00036	<0.010	0.015
Upper		Annual Median	0.016	0.241	<0.000010	0.000011	0.012	0.0060	0.000018	<0.00010	0.00035	<0.010	0.016
Greenhills	GH_HWGH_BRB	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>86%</th><th>0%</th><th>67%</th><th>24%</th><th>100%</th><th>38%</th><th>100%</th><th>0%</th></lrl<>	0%	0%	100%	86%	0%	67%	24%	100%	38%	100%	0%
Creek		% >BC or CCME WQG b	-	-	0%	0%	67%	0%	0%	-	0%	-	-
		% >BCWQG °	-	-	0%	-	-	0%	0%	-	0%	0%	-
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	83%
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	67%
		% >Level 3 Benchmark/updated EC	-		-		-		-	-	-	-	33%
		<u>n</u>	27	27	27	27	27	27	27	27	27	27	12
		Annual Minimum	0.0047	0.031	<0.000010	<0.000010	0.0021	<0.0030	<0.0000050	<0.00010	<0.00020	<0.010	0.0039
		Annual Maximum	0.013	0.201	0.000062	0.000051	0.010	0.022	0.00013	<0.00010	0.00078	0.024	0.012
		Annual Mean	0.088	0.137	0.000012	0.000012	0.0074	0.0043	0.000024	<0.00010	0.00032	0.011	0.0081
	OU OUAD	Annual Median	0.088	0.148	0.000010	0.000010	0.0080	0.0030	0.000012	<0.00010	0.00023	0.010	0.0081
	GH_GH1B	% <lrl< th=""><th>0%</th><th>0%</th><th>96%</th><th>96%</th><th>0%</th><th>81%</th><th>7.4%</th><th>100%</th><th>41%</th><th>96%</th><th>0%</th></lrl<>	0%	0%	96%	96%	0%	81%	7.4%	100%	41%	96%	0%
		% >BC or CCME WQG b	-	-	0%	0%	37%	0%	0%	-	0%	-	-
		% >BCWQG °	-	-	0%	-	-	0%	0%	-	0%	0%	- 070/
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	67%
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	25%
	l l	% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	0%

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b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

Watercourse	Station	Summary Statistic	Total Dissolved Solids (mg/L) ^a	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)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Aluminum (mg/L)	Total Antimony (mg/L)
		n	22	22	60	52	44	22	22	22	22	22	22	22	22
		Annual Minimum	491	8.2	8.0	7.8	112	1.3	0.0013	<0.0050	185	0.81	0.086	0.0032	0.00033
		Annual Maximum	1,540	8.5	8.8	15	327	5.3	0.015	0.030	897	2.8	0.20	0.15	0.00048
		Annual Mean	1,239	8.4	8.3	11	262	4.4	0.0063	0.010	711	1.7	0.15	0.017	0.00040
		Annual Median	1,390	8.4	8.3	11	267	4.9	0.0060	0.0083	786	1.8	0.15	0.0078	0.00040
	GH_GH1	% <lrl< th=""><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>23%</th><th>27%</th><th>0%</th><th>0%</th><th>0%</th><th>5%</th><th>0%</th></lrl<>	0%	0%	0%	0%	0%	0%	23%	27%	0%	0%	0%	5%	0%
		% >BC or CCME WQG b	-	-	0%	3.8%	0%	82%	0%	0%	82%	0%	-	0%	0%
		% >BCWQG °	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	-
		% >Level 1 Benchmark/updated EC	77%	-	-	-	-	0%	-	-	77%	-	-	-	-
Lower		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	55%	-	-	-	-
Greenhills		% >Level 3 Benchmark/updated EC	-	-	-	•	-	0%	-	-	0%	-	-	ı	-
Creek		n	12	12	23	18	23	12	12	12	12	12	12	12	12
Cleek		Annual Minimum	430	8.2	8.0	7.9	172	1.2	0.0029	<0.0050	176	1.1	0.12	0.0051	0.00030
		Annual Maximum	1,520	8.6	8.4	12	309	5.3	0.022	0.014	898	2.4	0.16	0.078	0.00045
		Annual Mean	1,116	8.4	8.3	10	248	3.8	0.0069	0.0086	616	2.0	0.14	0.021	0.00038
		Annual Median	1,280	8.4	8.3	11	252	4.4	0.0056	0.0078	740	2.0	0.14	0.0074	0.00036
	GH_GH2	% <lrl< th=""><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>0%</th><th>25%</th><th>25%</th><th>0%</th><th>0%</th><th>0%</th><th>8%</th><th>0%</th></lrl<>	0%	0%	0%	0%	0%	0%	25%	25%	0%	0%	0%	8%	0%
		% >BC or CCME WQG b	-	-	0%	5.6%	0%	67%	0%	0%	67%	0%	-	0%	0%
		% >BCWQG °	-		-	0%	-	0%	0%	0%	-	0%	0%	ı	-
		% >Level 1 Benchmark/updated EC	67%	-	-	-	-	0%	-	-	58%	-	-	ı	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	0%	-	-	42%	-	-	ı	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	0%	-	-	0%	-	-	-	-

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^a Screening values are applied to total dissolved solids concentrations, rather than Benchmarks/updated EC.

^b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

Watercourse	Station	Summary Statistic	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)	Total Cobalt (mg/L)	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)
		n	22	22	22	22	22	22	22	22	22	22	22	22
		Annual Minimum	0.00015	0.041	<0.000020	0.010	0.00010	<0.00010	<0.010	<0.000050	0.0089	0.00088	<0.0000050	0.0011
		Annual Maximum	0.00026	0.054	<0.000020	0.012	0.00029	0.00013	0.16	0.00012	0.022	0.0052	0.00000089	0.0026
		Annual Mean	0.00021	0.047	<0.000020	0.010	0.00014	0.00010	0.020	0.000053	0.017	0.0018	0.00000056	0.0016
		Annual Median	0.00022	0.046	<0.000020	0.010	0.00013	0.00010	0.010	0.000050	0.017	0.0015	0.0000050	0.0015
	GH_GH1	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>23%</th><th>4.5%</th><th>95%</th><th>77%</th><th>91%</th><th>0%</th><th>0%</th><th>95%</th><th>0%</th></lrl<>	0%	0%	100%	23%	4.5%	95%	77%	91%	0%	0%	95%	0%
		% >BC or CCME WQG b	-	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%
		% >BCWQG °	0%	-	-	-	-	0%	0%	0%	-	0%	-	0%
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
Lower		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
Greenhills		% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
Creek		n	12	12	12	12	12	12	12	12	12	12	12	12
Oleek		Annual Minimum	0.00015	0.042	<0.000020	<0.010	<0.00010	<0.00010	<0.010	<0.000050	0.0077	0.0016	<0.0000050	0.0011
		Annual Maximum	0.00034	0.060	<0.000020	0.013	0.00019	0.00010	0.085	0.000097	0.019	0.0063	0.0000056	0.0061
		Annual Mean	0.00022	0.048	<0.000020	0.011	0.00014	0.00010	0.029	0.000061	0.015	0.0031	0.0000010	0.0030
		Annual Median	0.00022	0.048	<0.000020	0.010	0.00012	0.00010	0.012	0.000050	0.016	0.0026	0.0000050	0.0027
	GH_GH2	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>33%</th><th>25%</th><th>92%</th><th>42%</th><th>67%</th><th>0%</th><th>0%</th><th>83%</th><th>0%</th></lrl<>	0%	0%	100%	33%	25%	92%	42%	67%	0%	0%	83%	0%
		% >BC or CCME WQG b	-	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%
		% >BCWQG °	0%	-	-	-	-	0%	0%	0%	-	0%	-	0%
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	-	-

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^a Screening values are applied to total dissolved solids concentrations, rather than Benchmarks/updated EC.

b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.2: Summary of Water Chemistry Data for Key Constituents Measured at Routine Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2022

Watercourse	Station	Summary Statistic	Total Nickel (mg/L)	Total Selenium (mg/L)	Total Silver (mg/L)	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Cadmium (mg/L)	Dissolved Cobalt (mg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)	Dissolved Nickel (mg/L)
		n	22	26	22	22	22	22	22	22	22	22	12
		Annual Minimum	0.0049	0.047	<0.000010	<0.000010	0.0027	<0.0030	<0.000050	<0.00010	0.00020	<0.010	0.0040
		Annual Maximum	0.010	0.198	<0.000010	0.000012	0.0098	0.0060	0.00011	<0.00010	0.00050	<0.010	0.0094
		Annual Mean	0.0081	0.133	<0.000010	0.000010	0.0076	0.0034	0.000017	<0.00010	0.00029	<0.010	0.0074
		Annual Median	0.0082	0.147	<0.000010	0.000010	0.0081	0.0030	0.0000071	<0.00010	0.00022	<0.010	0.0078
	GH_GH1	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>95%</th><th>0%</th><th>82%</th><th>27%</th><th>100%</th><th>36%</th><th>100%</th><th>0%</th></lrl<>	0%	0%	100%	95%	0%	82%	27%	100%	36%	100%	0%
		% >BC or CCME WQG b	-	-	0%	0%	32%	0%	0%	-	0%	-	-
		% >BCWQG °	-	-	0%	-	-	0%	0%	-	0%	0%	-
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	33%
Lower		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	0%
Greenhills		% >Level 3 Benchmark/updated EC	-	-	-	-	-	ı	-	-	-	-	0%
Creek		n	12	12	12	12	12	12	12	12	12	12	12
Oleek		Annual Minimum	0.0043	0.032	<0.000010	<0.000010	0.0022	<0.0030	0.0000052	<0.00010	<0.00020	<0.010	0.0037
		Annual Maximum	0.0087	0.172	<0.000010	0.000010	0.0095	0.0059	0.000086	<0.00010	0.00066	<0.010	0.0083
		Annual Mean	0.0072	0.117	<0.000010	0.000010	0.0066	0.0036	0.000025	<0.00010	0.00034	<0.010	0.0069
		Annual Median	0.0077	0.145	<0.000010	0.000010	0.0077	0.0030	0.000010	<0.00010	0.00030	<0.010	0.0074
	GH_GH2	% <lrl< th=""><th>0%</th><th>0%</th><th>100%</th><th>92%</th><th>0%</th><th>67%</th><th>0%</th><th>100%</th><th>25%</th><th>100%</th><th>0%</th></lrl<>	0%	0%	100%	92%	0%	67%	0%	100%	25%	100%	0%
		% >BC or CCME WQG b	-	-	0%	0%	8.3%	0%	0%	-	0%	-	-
		% >BCWQG °	-	-	0%	-	-	0%	0%	-	0%	0%	-
		% >Level 1 Benchmark/updated EC	-	-	-	-	-	-	0%	-	-	-	33%
		% >Level 2 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	0%
		% >Level 3 Benchmark/updated EC	-	-	-	-	-	-	-	-	-	-	0%

>50% of samples exceed the guideline or benchmark.

>95% of samples exceed the guideline or benchmark.

^a Screening values are applied to total dissolved solids concentrations, rather than Benchmarks/updated EC.

b Long-term average BC WQG or CCME mercury WQG for the protection of freshwater aquatic life. The BC WQG for total selenium were excluded because tissue-based benchmarks are considered more appropriate for screening selenium data. Working BC WQG were applied for alkalinity, antimony, barium, beryllium, chromium, thallium, and uranium.

^c Short-term maximum BC WQG for the protection of freshwater aquatic life.

Table E.3: Concentrations of Selenium Species Measured in Water Samples Collected from Biological Monitoring Areas on Greenhills and Gardine Creeks, 2022

Watercourse/ Waterbody	Biological Monitoring Area	Sample Date	Selenate (µg/L.)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Dimethylselenoxide and Methylseleninic Acid ^a
Candina Carali	RG_GAUT	14-Sep-22	0.510	0.131	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Gardine Creek	RG_GANF	13-Sep-22	5.24	0.167	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	RG_GHUT	15-Sep-22	244	0.422	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	0.022
	RG_GHNF	09-Sep-22	220	1.17	0.013	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	0.030
	RG_GHDT	16-Sep-22	229	1.25	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	0.026 ^b
	RG_GHFF	08-Sep-22	125	0.922	<0.010	0.021	<0.010	<0.010	<0.010	<0.010	<0.010	0.031 ^b
		13-Apr-22	56.2	0.406	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	0.022
Upper Greenhills Creek		17-May-22	49.0	0.335	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.021
Opper Greening Creek		13-Jul-22	95.6	0.683	<0.010	0.023	<0.010	<0.010	<0.010	<0.010	<0.010	0.033
	GH GH1A °	25-Jul-22	136	1.16	<0.010	0.029	<0.010	<0.010	<0.010	<0.010	<0.010	0.039
	GH_GHTA	09-Aug-22	165	1.25	<0.010	0.034	<0.010	<0.010	<0.010	<0.010	<0.010	0.044
		23-Aug-22	163	1.41	<0.010	0.035	<0.010	<0.010	<0.010	<0.010	<0.010	0.045
		08-Sep-22	154	1.27	0.011	0.039	<0.010	<0.010	<0.010	<0.010	<0.010	0.050
		20-Sep-22	153	1.12	<0.010	0.025	<0.010	<0.010	<0.010	<0.010	<0.010	0.035
Greenhills Creek Sedimentation Pond	RG_GHP	19-Sep-22	129	2.63	0.118	0.079	<0.010	<0.010	<0.010	<0.010	<0.010	0.197
		13-Apr-22	60.1	0.893	0.017	0.052	<0.010	<0.010	<0.010	<0.010	<0.010	0.069
		17-May-22	39.5	0.560	<0.010	0.025	<0.010	<0.010	<0.010	<0.010	<0.010	0.035
		13-Jul-22	85.7	0.644	<0.010	0.019	<0.010	<0.010	<0.010	<0.010	<0.010	0.029
	CH CHIED De4 °	25-Jul-22	101	1.59	0.061	0.052	<0.010	<0.010	<0.010	<0.010	<0.010	0.113
Lower Greenhills Creek	GH_GH1SP_DS1°	09-Aug-22	119	2.1	0.035	0.087	<0.010	<0.010	<0.010	<0.010	<0.010	0.122
LOWER GLECHHIIIS CIECK		24-Aug-22	77.8	1.51	0.038	0.039	<0.010	<0.010	<0.010	<0.010	<0.010	0.077
		08-Sep-22	112	2.41	0.081	0.087	<0.010	<0.010	<0.010	<0.010	<0.010	0.168
		20-Sep-22	135	2.90	0.055	0.082	<0.010	<0.010	<0.010	<0.010	<0.010	0.137
	RG_GHBP	28-Feb-22	132	1.33	0.040	0.052	<0.010	<0.010	<0.010	<0.010	<0.010	0.092
	NG_GHBF	12-Sep-22	137	2.84	0.111	0.061	<0.010	<0.010	<0.010	<0.010	<0.010	0.172

Exceeds the Long-term Average BC WQG for the protection of freshwater aquatic life (2 µg/L; BCMOECCS 2021a).

Exceeds the draft screening value (0.025 µg/L) indicative of conditions that may cause an incremental increase in bioaccumulation (ADEPT 2022).

Notes: µg/L = micrograms per litre; < = less than; BC WQG = British Columbia Water Quality Guideline; LRL = Laboratory Reporting Limit.

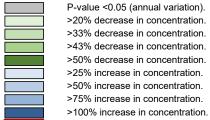
^a Values <LRL were replaced with the LRL.

b It is possible that this value is less than the draft screening value; however, because the <LRL value for dimethylselenoxide was replaced with the LRL, it is "conservatively" identified as being greater than the screening value.

^c Data are from the 2022 Elk Valley Selenium Speciation Monitoring Program (ADEPT et al. 2023).

Table E.4: Temporal Changes in Concentrations of Water Quality Constituents with Early Warning Triggers (EWT) at Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2016 to 2022

			inual	Q1. Is there	a positive or n	egative change	in concentration	ons since the b	ase year (b) of	monitoring?	- 02 ls t	the 2022 ann	ual mean gre	ater or less	than all annı	ıal historical	means (201	2 to 2020)? ^d
Constituent	Station	Vari	ation ^a		MO	O ^b and Signific	ance (bolded) 1	from Base Year	(b) ^c		Q2. 13	tric 2022 arm	aai iiicaii gic	ater or less	than an anni	iai ilistoricai	means (20)	2 (0 2020) :
		DF	P-value	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	2022	2022 vs. 2016 to 2021
	GH GC1	5	0.001	-	b	4.43	-25.6	-24.0	-39.7	-29.1	-	AB	Α	ВС	ABC	С	С	No
	GH_CTF	5	0.163	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Total Dissolved	GH_HWGH_BRB	5	0.668	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Solids	GH GH1B	5	0.006	-	b	13.7	-4.95	8.81	-2.36	-7.81	-	AB	Α	AB	AB	AB	В	No
	GH GH1	6	0.001	b	13.0	25.8	-0.779	17.1	10.0	4.55	С	ABC	Α	С	AB	ABC	ВС	No
	GH GH2	5	0.022	-	b	7.00	-7.01	-2.13	-5.38	-12.7	-	AB	Α	AB	AB	AB	В	No
	GH GC1	5	0.554	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_CTF	5	0.001	-	b	0.368	-10.4	-19.8	-26.4	-36.4	-	Α	Α	AB	ВС	CD	D	No
<b>.</b>	GH HWGH BRB	5	0.001	-	b	0.678	-8.37	-5.40	-21.1	-28.6	-	Α	Α	Α	Α	AB	В	No
Nitrate (as N)	GH GH1B	5	0.001	-	b	19.1	-14.9	-5.72	-25.9	-35.8	-	AB	Α	ВС	AB	CD	D	No
	GH GH1	6	0.001	b	23.9	38.7	-15.0	-5.35	-15.5	-23.7	ВС	AB	Α	CD	С	CD	D	No
	GH GH2	5	0.001	-	b	-8.57	-33.2	-34.1	-41.4	-49.6	-	Α	Α	В	В	ВС	С	No
	GH GC1	1	0.051	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH CTF	1	0.001	-	b	158	-	-	-	_	_	В	Α	-	_	-	-	1
	GH_HWGH_BRB	1	0.014	-	-	b	-	-	-40.1	-	_	_	Α	-	_	В	-	1
Nitrite (as N)	GH GH1B	1	0.012	-	b	103	-	-	-	-	_	В	Α	-	_	-	-	<u> </u>
	GH GH1	6	0.001	b	31.0	60.2	-20.0	-31.1	-33.9	-36.9	AB	AB	Α	В	В	В	В	No
	GH GH2	5	0.001	-	b	-0.645	-49.5	-56.5	-72.5	-44.7	-	AB	Α	ABC	ВС	С	ABC	No
	GH GC1	5	0.001	-	b	4.03	-31.0	-33.3	-49.1	-34.6	-	AB	Α	ABC	ABC	С	ВС	No
	GH CTF	5	0.645	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH HWGH BRB	5	0.658	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Sulphate	GH_GH1B	5	0.040	-	b	14.9	-5.08	9.49	1.17	-8.03	-	AB	Α	AB	AB	AB	В	No
	GH GH1	6	0.001	b	14.4	32.8	-0.104	19.5	19.8	12.5	ВС	ABC	Α	С	AB	ABC	ABC	No
	GH GH2	5	0.154	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH GC1	5	0.001	-	b	54.0	-36.5	-61.4	-51.4	-54.8	-	AB	Α	ВС	С	С	С	No
	GH CTF	5	0.001	-	b	-18.6	-34.6	-43.8	-51.0	-57.4	-	Α	В	С	D	Е	F	Ţ
Antimony (Sb)-	GH HWGH BRB	5	0.001	-	b	-17.1	-30.8	-35.1	-46.0	-52.6	-	Α	В	С	С	D	Е	Ţ
Total	GH GH1B	5	0.001	-	b	11.2	-34.6	-31.4	-40.2	-49.3	-	Α	Α	В	В	В	С	Ţ
	GH_GH1	6	0.001	b	-13.7	7.85	-43.1	-43.4	-48.7	-53.3	AB	В	Α	С	С	CD	D	No
	GH GH2	5	0.001	-	b	6.18	-35.7	-41.9	-42.4	-50.7	-	Α	Α	В	ВС	ВС	С	No
	GH GC1	5	0.301	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH CTF	5	0.001	-	b	-12.2	-17.2	-20.4	-21.1	-11.1	-	Α	ВС	ВС	ВС	С	В	No
	GH HWGH BRB	5	0.001	-	b	-11.8	-20.1	-21.9	-22.3	-13.5	-	Α	В	ВС	С	С	В	No
Barium (Ba)-Total	GH GH1B	5	0.039	-	b	-8.95	-23.9	-19.6	-16.7	-16.0	-	Α	AB	В	AB	AB	AB	No
	GH GH1	6	0.001	b	-0.166	-4.93	-27.5	-26.0	-26.6	-15.8	Α	Α	Α	С	С	С	В	No
	GH_GH2	5	0.001	-	b	-8.52	-27.1	-24.0	-28.8	-21.6	-	Α	Α	В	В	В	В	No



*Bold Significant increase or decrease from base year (b).

Notes: DF = degrees of freedom; MOD = Magnitude of Difference; - = insufficient data for comparison (i.e., < six months of recorded data or >75% of values <LRL in a given year); nc = post hoc test not completed because of non-significant Year term; < = less than; > = greater than; % = percent; LRL = laboratory reporting limit; ANOVA = Analysis of Variance.

^a The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

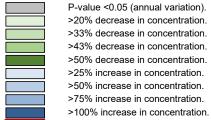
^b The MOD was calculated as the concentration in each year minus the concentration in the first or base year divided by the concentration in the first or base year × 100.

^c Significance between years was determined using all pairwise comparisons with Tukey corrections.

^d Years that share a letter are not significantly different. Letters were assigned such that "A" represents the highest value.

Table E.4: Temporal Changes in Concentrations of Water Quality Constituents with Early Warning Triggers (EWT) at Water Quality Monitoring Stations on Greenhills and Gardine Creeks, 2016 to 2022

			inual	Q1. Is there	a positive or n	egative change	in concentrati	ons since the b	oase year (b) of	monitoring?	- O2 ls:	the 2022 ann	ual mean gre	ater or less	than all annı	al historical	means (201	2 to 2020)? ^d
Constituent	Station	Vari	ation ^a		MOI	O ^b and Signific	ance (bolded)	from Base Yea	r (b) ^c		QZ. 13	ine zozz ann	dai illean gre	ater or less	triair air airiic	ai mstoricai	means (20)	2 10 2020):
		DF	P-value	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	2022	2022 vs. 2016 to 2021
	GH_GC1	5	0.015	-	b	-9.60	-12.0	-18.7	-20.5	-25.3	-	Α	AB	AB	AB	AB	В	No
	GH_CTF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
Damain (D) Tatal	GH_HWGH_BRB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
Boron (B)-Total	GH_GH1B	5	0.283	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_GH1	6	0.001	b	-11.6	-7.43	-9.91	-11.1	-10.1	-6.75	Α	В	В	В	В	В	AB	No
	GH GH2	5	0.594	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH GC1	5	0.001	-	b	52.8	-8.56	-9.79	-32.0	-14.2	-	AB	Α	В	В	В	В	No
	GH_CTF	5	0.001	-	b	8.10	5.59	17.6	15.7	31.5	-	С	ВС	ВС	AB	AB	Α	No
	GH HWGH BRB	5	0.001	-	b	8.19	5.96	27.7	21.1	33.1	-	D	BCD	CD	AB	ABC	Α	No
Lithium (Li)-Total	GH GH1B	5	0.001	-	b	30.0	-8.70	16.4	7.34	13.7	_	ВС	Α	С	AB	ВС	AB	No
	GH GH1	6	0.001	b	17.4	74.0	2.08	28.3	25.9	36.3	С	BC	Α	С	В	В	В	No
	GH GH2	5	0.001	-	b	24.7	-8.06	1.49	0.504	5.56	-	В	Α	В	В	В	AB	No
	GH GC1	5	0.001	-	b	15.1	-69.7	-79.1	-54.6	-42.8	_	A	Α	BC	С	ABC	AB	No
	GH CTF	5	0.001	-	b	-30.9	-44.4	-43.5	-54.5	-60.0		A	AB	В	В	В	В	No
Manganese (Mn)-	GH_HWGH_BRB	5	0.001	_	b	-42.5	-61.7	-71.6	-75.1	-66.6		A	AB	BC	С	C	C	No
Total	GH GH1B	5	0.001	_	b	-45.6	-72.5	-60.4	-58.6	-33.6	_	A	ABC	C	BC	ABC	AB	No
. 516.	GH_GH1	6	0.001	b	-8.97	3.32	-27.4	-31.6	-50.5	-46.1	A	AB	A	ABC	ABC	C	BC	No
	GH GH2	5	0.030	-	-0.57 b	-11.2	-29.7	-32.3	-31.9	-42.0	-	A	AB	AB	ABO	AB	В	No
	GH GC1	5	0.033	_	b	106	17.9	16.5	21.7	6.80	-	В	A	AB	AB	AB	В	No
	GH CTF	5	0.001	-	b	-19.9	-34.7	-41.6	-47.9	- <b>54.3</b>	_	A	В	C	CD	D	E	110
Molybdenum (Mo)-	GH HWGH BRB	5	0.001	-	b	-19.1	-32.5	-37.3	-45.5	-42.5		A	AB	BC	BC	С	C	No
Total	GH_GH1B	5	0.001	_	b	31.4	-24.8	-24.4	-32.7	-35.0		AB	AB	С	BC	C	C	No
rotai	GH GH1	6	0.001	b	-14.5	36.6	-34.8	-43.6	-46.7	-48.8	В	BC	A	CD	D	D	D	No
	GH GH2	5	0.001	-	-14.5 b	51.8	- <b>16.3</b>	<b>-43.6</b> <b>-</b> 35.7	-46.7 -16.1	-38.2		AB	A	BC	BC	BC	С	No
	GH_GH2	5	0.001	-	b	46.7	-16.3 -45.8	-55.7 -57.1	-10.1 -65.4	<b>-50.2</b>	-	AB	A	BC	С	С	BC	No
	GH CTF	5	0.001	_	b	-11.2	-45.8	-50.3	-60.3	-64.2	-	Ab	A	В	BC	CD	D	No
	GH HWGH BRB	5 5			b	-11.2	-46.6	-50.3 -48.9	-60.8	-63.4				В	В	С	С	No
Nickel (Ni)-Total	GH_HWGH_BRB GH_GH1B	5	0.001	-	b	-19.4	-50.4 -54.9	-48.9 -47.7	-60.8 -58.6	-63.4	-	A	A	BC	В	С	С	No No
		6		-	6.86	3.89	-54.9	-47.7 -45.1							В	С	С	
	GH_GH1		0.001	b					-56.4	-56.5	А	A	A	BC		_		No
	GH_GH2	5	0.001	-	b	-28.6	-60.8	-66.3	-65.6	-67.6	-	A	Α	В	В	В	В	No
	GH_GC1	5	0.633	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_CTF	5	0.970	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Selenium (Se)-	GH_HWGH_BRB	5	0.705	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Total	GH_GH1B	5	0.215	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_GH1	6	0.001	b	37.1	53.4	18.7	45.9	38.7	32.0	С	AB	Α	BC	Α	AB	AB	No
	GH_GH2	5	0.187	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No



*Bold Significant increase or decrease from base year (b).

Notes: DF = degrees of freedom; MOD = Magnitude of Difference; - = insufficient data for comparison (i.e., < six months of recorded data or >75% of values <LRL in a given year); nc = post hoc test not completed because of non-significant Year term; < = less than; > = greater than; % = percent; LRL = laboratory reporting limit; ANOVA = Analysis of Variance.

^a The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

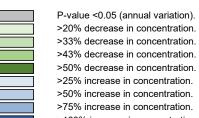
^b The MOD was calculated as the concentration in each year minus the concentration in the first or base year divided by the concentration in the first or base year × 100.

^c Significance between years was determined using all pairwise comparisons with Tukey corrections.

^d Years that share a letter are not significantly different. Letters were assigned such that "A" represents the highest value.

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			nnual	Q1. Is there	a positive or n	egative change	in concentrati	ons since the b	pase year (b) of	monitoring?	02 ls	the 2022 ann	ual mean ara	ator or loss	than all annı	ıal historical	means (201	2 to 2020)? ^d
Constituent	Station	Vari	ation ^a		MOI	O ^b and Signific	ance (bolded)	from Base Year	r (b) ^c		QZ. 13	ine zozz ann	dai illeali gie	ater or less	triari ari arriit	iai mstoricai	means (201	2 (0 2020):
		DF	P-value	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	2022	2022 vs. 2016 to 2021
	GH_GC1	5	0.001	-	b	10.6	-33.0	-37.1	-45.2	-35.3	-	Α	Α	В	В	В	В	No
	GH_CTF	5	0.813	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Unaniona (U) Tatal	GH_HWGH_BRB	5	0.833	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Uranium (U)-Total	GH_GH1B	5	0.007	-	b	16.4	-7.55	9.39	-0.660	-6.53	-	AB	Α	В	AB	AB	В	No
	GH_GH1	6	0.001	b	16.3	36.1	-2.68	17.2	16.4	12.7	BC	AB	Α	С	AB	AB	ВС	No
	GH_GH2	5	0.121	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_GC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
	GH_CTF	5	0.001	-	b	-9.72	-30.7	-49.2	-58.2	-56.8	-	Α	Α	AB	ВС	С	ВС	No
Zina (Zn) Tatal	GH_HWGH_BRB	5	0.238	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
Zinc (Zn)-Total	GH_GH1B	1	0.005	-	b	-54.0	-	-	-	-	-	Α	В	-	-	-	-	<b>\</b>
	GH_GH1	3	0.608	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_GH2	2	0.036	-	b	-	-	-	-51.6	-32.4	-	Α	-	-	-	В	AB	No
	GH_GC1	5	0.011	-	b	-29.7	-11.0	-36.6	-36.5	-46.9	-	Α	AB	AB	AB	AB	В	No
	GH_CTF	5	0.016	-	b	-37.5	97.0	121	78.5	42.8	-	AB	В	AB	Α	AB	AB	No
Cadmium (Cd)-	GH_HWGH_BRB	5	0.028	-	b	-60.2	-24.1	42.1	6.78	87.7	-	AB	В	AB	AB	AB	Α	No
Dissolved	GH_GH1B	5	0.002	-	b	-14.3	-6.17	80.3	49.8	69.2	-	ABC	С	ВС	Α	ABC	AB	No
	GH_GH1	6	0.012	b	45.1	-2.17	35.2	63.8	-13.3	26.6	AB	AB	AB	AB	Α	В	AB	No
	GH_GH2	5	0.023	-	b	17.8	-15.2	4.33	-29.5	-9.74	-	AB	Α	AB	AB	В	AB	No
	GH_GC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
	GH_CTF	1	0.001	-	b	-48.4	-	-	-	-	-	Α	В	-	-	-	-	<b>↓</b>
Cobalt (Co)-	GH_HWGH_BRB		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
Dissolved	GH_GH1B	1	0.187	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	No
	GH_GH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No
	GH_GH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No



>75% increase in concentration. >100% increase in concentration.

Significant increase or decrease from base year (b).

Notes: DF = degrees of freedom; MOD = Magnitude of Difference; - = insufficient data for comparison (i.e., < six months of recorded data or >75% of values < LRL in a given year); nc = post hoc test not completed because of non-significant Year term; < = less than; > = greater than; % = percent; LRL = laboratory reporting limit; ANOVA = Analysis of Variance.

^a The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

b The MOD was calculated as the concentration in each year minus the concentration in the first or base year divided by the concentration in the first or base year × 100.

^c Significance between years was determined using all pairwise comparisons with Tukey corrections.

^d Years that share a letter are not significantly different. Letters were assigned such that "A" represents the highest value.

Table E.5: Comparison of Relative Monthly Mean Concentrations of Constituents Before (May to September [2017]) and After (May to September [2018 to 2022]) Calcite Treatment for Stations Upstream (GH_GH1) and Downstream (GH_GH2) of Water Treatment ^a

					Sample	e Size ^{a,b}			ANOVA			ratio of the co							
	Constituent	Units			-		Tr.		P-value		/s. 2018		rs. 2019		/s. 2020		/s. 2021		s. 2022
			2017	2018	2019	2020	2021	2022		P-value	MOD (%) ^d	P-value	MOD (%) ^d	P-value	MOD (%) ^d	P-value	MOD (%) ^d	P-value	MOD (%) ^d
	Conductivity, Field	μS/cm	5	4	4	0	0	0	0.455	-	-	-	-	-	-	-	-	-	-
	Conductivity, Lab	μS/cm	5	4	4	4	5	4	0.980	-	-	-	-	-	-	-	-	-	-
	Hardness (as CaCO ₃ )	mg/L	5	4	4	4	5	0	0.919	-	-	-	-	-	-	-	-	-	-
	pH, Field	рН	5	4	4	4	5	4	0.751	-	-	-	-	-	-	-	-	-	-
	pH, Lab	pН	5	4	4	4	5	4	0.544	-	-	-	-	-	-	-	-	-	-
	ORP, Field	mV	5	3	4	4	5	4	0.219	-	-	-	-	-	-	-	-	-	-
Physical	ORP, Lab	mV	5	4	4	4	5	4	0.437	-	-	-	-	-	-	-	-	-	-
Characteristics	Total Suspended Solids, Lab	mg/L	5	4	4	4	5	4	0.758	-	-	-	-	-	-	-	-	-	-
	Total Dissolved Solids	mg/L	5	4	4	4	5	4	0.934	-	-	-	-	-	-	-	-	-	-
	Turbidity, Field	NTU	4	4	4	4	5	4	0.977	-	-	-	-	-	-	-	-	-	-
	Turbidity, Lab	NTU	5	4	4	4	5	4	0.470	-	-	-	-	-	-	-	-	'n	-
	Dissolved Oxygen-Field	mg/L	5	4	4	4	5	4	0.413	-	-	-	-	-	-	-	-	-	-
	Dissolved Oxygen-Field	%	5	4	4	4	5	0	0.430	-	-	=	-	-	-	-	-	-	-
	Temperature-Field	°C	5	4	4	4	5	4	0.740	-	-	-	-	-	-	-	-	-	-
	Acidity (as CaCO ₃ )	mg/L	0	0	0	0	0	0	nd	_	-	-	-	-	-	-	-	-	-
A . 174	Alkalinity, Bicarbonate (as CaCO ₃ )	mg/L	5	4	4	4	5	4	0.311	-	-	-	-	-	-	-	-	-	-
Acidity and	Alkalinity, Carbonate (as CaCO ₃ )	mg/L	5	4	4	4	5	4	0.795	-	-	-	-	-	-	-	-	-	-
Alkalinity	Alkalinity, Hydroxide (as CaCO ₃ )	mg/L	0	0	0	0	0	0	nd	_	-	-	-	-	_	-	-	-	-
	Alkalinity, Total (as CaCO ₃ )	mg/L	5	4	4	4	5	4	0.066	_	_	_	_	_	_	_	_	-	_
	Ammonia as N	mg/L	5	4	4	4	5	3	0.046	0.302	-	0.698	_	0.804	_	0.511	_	0.536	_
	Bromide (Br)	mg/L	0	0	0	0	0	0	nd	-	_	-	_	-	_	-	_	-	_
	Chloride (CI)	mg/L	2	4	2	3	5	4	nd	_	-	-	-	_	_	_	_	_	_
	Fluoride (F)	mg/L	4	4	4	3	5	4	0.494	_	-	_	-	_	_	_	_	_	_
Anions and	Nitrate (as N)	mg/L	5	4	4	4	5	4	0.954	_	_	_	-	_	_		_		_
Nutrients	Nitrite (as N)	mg/L	5	4	3	4	3	4	0.187		-		-	-	-		-	-	
Numerio	Total Kjeldahl Nitrogen	mg/L	5	4	4	4	5	4	0.422		-	<u> </u>		-	_		-	-	-
	Orthophosphate-Dissolved (as P)	mg/L	3	3	0	1	3	2	0.583		-	<u> </u>	-	-	_		-	-	-
	Phosphorus (P)-Total	mg/L	5	4	4	4	5	4	0.041	0.702	-	0.902		0.795	_	0.046	88	0.933	_
	Sulphate (SO ₄ )		5	4	4	4	5	4	0.838		-				-	0.040		0.933	
		mg/L		4		4		4		-	-	-	-	-	-	-	-	-	-
Organic Carbon	Dissolved Organic Carbon	mg/L	5	-	4	4	5	-	0.101	-	-	-	-	-	-	-	-	-	-
	Total Organic Carbon	mg/L	5	4	•		5	4	0.665	-	-	=	-	-	-	-	-	-	-
	Aluminum (Al)	mg/L	5	4	4	4	5	4	0.272	-	-	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	5	4	4	4	5	4	0.747	-	-	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	5	4	4	4	5	4	0.299	-	-	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	5	4	4	4	5	4	0.523	-	-	-	-	-	-	-	-	-	-
	Beryllium (Be)	mg/L	1	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	0	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Boron (B)	mg/L	5	4	2	4	4	4	0.739	-	-	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	5	4	4	4	5	4	0.073	-	-	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	5	4	4	4	5	4	0.683	-	-	-	-	-	-	-	-	-	-
Total Metals	Chromium (Cr)	mg/L	5	2	3	4	5	4	0.683	-	-	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	2	2	0	0	2	2	nd	-	-	-	-	-		-	-	•	-
	Copper (Cu)	mg/L	2	1	1	3	3	3	nd	-	-	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	5	4	4	4	5	4	0.430	-	-	-	-	-	-	-	-	•	-
	Lead (Pb)	mg/L	1	1	0	1	3	3	nd	-	-	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	5	4	4	4	5	4	0.779	-	-	-	-	-	-	-	-	-	-
	Magnesium (Mg)	mg/L	5	4	4	4	5	4	0.706	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	5	4	4	4	5	4	0.417	-	-	-	-	-	-	-	-	-	-
	Mercury (Hg)	μg/L	4	3	4	4	5	0	0.094	-	_	_	-	-	-	-	-	-	-
	Methyl Mercury	μg/L	0	4	4	4	5	4	nd	_	_	_	_	-	_	-	_	-	-
		r-3/-		· ·		1			1	1	I		I	1	1		1		I

P-value <0.05.

Positive MOD (increase in concentration of constituent at GH_GH2 relative to GH_GH1).

Negative MOD (decrease in concentration of constituent at GH_GH2 relative to GH_GH1).

Notes: ANOVA = Analysis of Variance; vs. = versus; MOD = magnitude of difference; % = percent;  $\mu$ S/cm = microSiemens per centimetre; -= no significant difference observed; CaCO3 = calcium carbonate; my/L = milligrams per litre; ORP = oxidation-reduction potential; mV = millivolts; NTU = Nephelometric Turbidity Units; °C = degrees Celsius; nd = insufficient data were available to conduct the analysis;  $\mu$ S/L = micrograms per litre; <= less than; LRL = laboratory reporting limit.

^a Data for months when the antiscalant addition system was not operating were excluded from the analysis.

b Comparison were completed as a two-sample t-test between time periods on the relative differences between areas, calculated as log₁₀(GH_GH1). Values less than the LRL when only one of the two paired samples was <LRL. No Difference was calculated when concentrations in both paired samples were <LRL.

 $^{^{\}rm c}$  Only comparisons with more than three difference values for both time periods were included.

d The MOD was calculated as the observed post-treatment concentration at (GH_GH2_{observed post-treatment} - GH_GH2_{predicted post-treatment} + 100%, where GH_GH2_{predicted post-treatment} is the geometric mean for GH_GH2 post-treatment and GH_GH2_{predicted post-treatment} is the predicted mean concentration for GH_GH2 assuming the concentration ratio of GH_GH1 to GH_GH2 is the same as pre-treatment (i.e., GH_GH2_{predicted post-treatment}) + log₁₀(GH_GH1_{post-treatment}) + log₁₀(GH_GH2_{predicted post-treatment}).

Table E.5: Comparison of Relative Monthly Mean Concentrations of Constituents Before (May to September [2017]) and After (May to September [2018 to 2022]) Calcite Treatment for Stations Upstream (GH_GH1) and Downstream (GH_GH2) of Water Treatment ^a

					Sample	e Size ^{a,b}			ANOVA		Does th	e ratio of the co	oncentrations b	etween GH_0	GH1 and GH	GH2 change	e among yea	s? °	
	Constituent	Units			•		T		P-value		vs. 2018		/s. 2019		s. 2020		/s. 2021		vs. 2022
			2017	2018	2019	2020	2021	2022		P-value	MOD (%) ^d	P-value	MOD (%) ^d	P-value	MOD (%) d	P-value	MOD (%) d	P-value	MOD (%) ^d
	Molybdenum (Mo)	mg/L	5	4	4	4	5	4	0.010	0.147	-	0.0021	140	0.158	-	0.020	87	0.026	87
	Nickel (Ni)	mg/L	5	4	4	4	5	4	0.367	-	-	-	-	-	-	-	-	-	-
	Potassium (K)	mg/L	5	4	4	4	5	4	0.381	-	-	-	-	-	-	-	-	-	-
	Selenium (Se)	μg/L	5	4	4	4	5	4	0.777	-	-	-	-	-	-	-	-	-	-
	Silicon (Si)-Total	mg/L	5	4	4	4	5	4	0.837	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	1	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
Total Metals	Sodium (Na)	mg/L	5	4	4	4	5	4	0.778	-	-	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	5	4	4	4	5	4	0.985	-	-	-	-	-	-	-	-	-	-
	Thallium (TI)	mg/L	5	4	0	0	1	2	0.372	-	-	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	0	0	0	1	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Titanium (Ti)	mg/L	0	0	0	0	5	3	nd	-	-	-	-	-	-	-	-	-	-
	Uranium (U)	mg/L	5	4	4	4	5	4	0.689	-	-	-	-	-	-	-	-	-	-
<u> </u>	Vanadium (V)	mg/L	2	0	1	1	2	2	nd	-	-	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	2	1	1	4	4	3	nd	-	-	-	-	-	-	-	-	-	-
	Aluminum (AI)	mg/L	3	1	1	0	4	4	0.525	-	-	-	-	-	-	-	-	-	-
	Antimony (Sb)	mg/L	5	4	4	4	5	4	0.211	-	-	-	-	-	-	-	-	-	-
	Arsenic (As)	mg/L	5	4	4	4	5	4	0.989	-	-	-	-	-	-	-	-	-	-
	Barium (Ba)	mg/L	5	4	4	4	5	4	0.016	0.168	-	0.626	-	0.996	-	0.947	-	0.161	-
	Beryllium (Be)	mg/L	0	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Bismuth (Bi)	mg/L	0	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Boron (B)	mg/L	5	3	3	3	4	3	0.907	-	-	-	-	-	-	-	-	-	-
	Cadmium (Cd)	mg/L	4	4	4	4	5	4	0.244	-	-	-	-	-	-	-	-	-	-
	Calcium (Ca)	mg/L	5	4	4	4	5	4	0.453	-	-	-	-	-	-	-	-	-	-
	Chromium (Cr)	mg/L	2	0	4	2	3	1	nd	-	-	-	-	-	-	-	-	-	-
	Cobalt (Co)	mg/L	2	2	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Copper (Cu)	mg/L	3	1	0	4	5	4	0.668	-	-	-	-	-	-	-	-	-	-
	Iron (Fe)	mg/L	1	0	0	0	1	0	nd	-	-	-	-	-	-	-	-	-	-
	Lead (Pb)	mg/L	1	0	0	0	1	0	nd	-	-	-	-	-	-	-	-	-	-
	Lithium (Li)	mg/L	5	4	4	4	5	4	0.234	-	-	-	-	-	-	-	-	-	-
Dissolved Metals	Magnesium (Mg)	mg/L	5	4	4	4	5	4	0.874	-	-	-	-	-	-	-	-	-	-
	Manganese (Mn)	mg/L	5	4	4	4	5	4	0.210	-	-	-	-	-	-	-	-	-	-
	Mercury (Hg)	μg/L	1	1	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Molybdenum (Mo)	mg/L	5	4	4	4	5	4	0.006	0.157	-	0.002	132	0.158	-	0.014	88	0.007	88
	Nickel (Ni)	mg/L	5	4	4	4	5	4	0.222	-	-	-	-	-	-	-	-	-	-
	Potassium (K)	mg/L	5	4	4	4	5	4	0.769	-	-	-	-	-	-	-	-	-	-
	Selenium (Se)	μg/L	5	4	4	4	5	4	0.267	-	-	-	-	-	-	-	-	-	-
	Silicon (Si)	mg/L	5	4	4	4	5	4	0.852	-	-	-	-	-	-	-	-	-	-
	Silver (Ag)	mg/L	0	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Sodium (Na)	mg/L	5	4	4	4	5	4	0.880	-	-	-	-	-	-	-	-	-	-
	Strontium (Sr)	mg/L	5	4	4	4	5	4	0.928	-	-	-	-	-	-	-	-	-	-
	Thallium (TI)	mg/L	3	4	0	0	1	0	0.544	-	-	-	-	-	-	-	-	-	-
	Tin (Sn)	mg/L	0	0	0	1	0	0	nd	-	-	-	-	-	-	-	-		-
	Titanium (Ti)	mg/L	0	0	0	0	1	0	nd	-	-	-	-	-	-	-	-		-
	Uranium (U)	mg/L	5	4	4	4	5	4	0.475	-	-	-	-	-	-	-	-		-
	Vanadium (V)	mg/L	0	0	0	0	0	0	nd	-	-	-	-	-	-	-	-	-	-
	Zinc (Zn)	mg/L	2	1	1	4	4	3	nd	-	-	-	-	-	-	-	-	-	-

P-value <0.05

Positive MOD (increase in concentration of constituent at GH_GH2 relative to GH_GH1).

Negative MOD (decrease in concentration of constituent at GH_GH2 relative to GH_GH1).

Notes: ANOVA = Analysis of Variance; vs. = versus; MOD = magnitude of difference; % = percent;  $\mu$ S/cm = microSiemens per centimetre; -= no significant difference observed; CaCO3 = calcium carbonate; my/L = milligrams per litre; ORP = oxidation-reduction potential; mV = millivolts; NTU = Nephelometric Turbidity Units; °C = degrees Celsius; nd = insufficient data were available to conduct the analysis;  $\mu$ S/L = micrograms per litre; <= less than; LRL = laboratory reporting limit.

^a Data for months when the antiscalant addition system was not operating were excluded from the analysis.

b Comparison were completed as a two-sample t-test between time periods on the relative differences between areas, calculated as log₁₀(GH_GH1) - log₁₀(GH_GH1). Values less than the LRL when only one of the two paired samples was <LRL. No Difference was calculated when concentrations in both paired samples were <LRL.

 $^{^{\}rm c}$  Only comparisons with more than three difference values for both time periods were included.

d The MOD was calculated as the observed post-treatment concentration at (GH_GH2_{observed post-treatment} – GH_GH2_{predicted post-treatment} – GH_GH2_{predicted post-treatment} is the geometric mean for GH_GH2 post-treatment and GH_GH2_{predicted post-treatment} is the predicted mean concentration for GH_GH2 assuming the concentration ratio of GH_GH1 to GH_GH2 is the same as pre-treatment (i.e., GH_GH2_{predicted post-treatment}) + log₁₀(GH_GH1_{post-treatment}) + log₁₀(GH_GH1_{post-treatment}).

Table E.6: Depth Profiles for Greenhills Creek Sedimentation Pond, 2018 to 2022

Date	UTM Coordinat	tes (NAD83, 11U)	Depth (m)	Temperature (°C)	pН	Dissolve	d Oxygen	Specific Conductance (µS/cm)
Date	Easting	Northing	Depth (III)	remperature ( C)	рп	mg/L	%	Specific Conductance (µ5/cm)
			Surface	12.4	8.01	9.80	109	1,594
		-	1.0	12.5	8.02	9.70	110	1,594
7-Sep-18	653480	5545945	3.0	12.5 12.5	8.03 8.04	9.90 9.90	112 110	1,595 1,596
7-3ep-10	033480	3343943	4.0	12.5	8.03	10.10	113	1,595
		-	5.0	12.1	8.03	10.40	116	1,604
			5.5	12.0	7.96	9.80	110	1,608
		-	Surface	4.9	8.85	15.67	123	1,691
		_	0.5 1.0	4.7 4.6	8.87 8.88	15.70 15.73	123 123	1,693 1,693
11-Oct-18	653484	5545945	2.0	4.4	8.89	15.75	123	1,694
			3.0	4.4	8.89	15.74	122	1,694
			4.0	4.4	8.89	15.74	122	1,694
			5.0	4.4	8.89	15.81	123	1,694
		-	Surface 0.5	6.8	8.32 8.36	10.64 10.93	87 89	1,005 1,006
		-	1.0	6.7	8.37	10.94	90	1,041
			1.5	6.4	8.21	10.78	89	1,228
		-	2.0	4.8	7.90	8.38	66	1,691
24-Apr-19	653471	5545949	2.5 3.0	4.4	7.87 7.84	7.73 7.24	60 56	1,704 1,709
24-Api-19	033471	3343949	3.5	4.0	7.72	4.20	32	1,718
			4.0	4.1	7.60	3.40	26	1,720
			4.5	4.1	7.58	3.28	26	1,718
			5.0	4.1	7.59	3.18	24	1,719
		-	5.5 6.0	4.1	7.59 7.50	3.11	24	1,719
			6.0 Surface	4.1 14.1	7.59 8.17	3.07 10.90	24 107	1,719 1,365
			1.0	14.0	8.17	10.90	107	1,366
			2.0	13.8	8.18	10.90	106	1,368
12-Sep-19	653471	5545949	3.0	13.8	8.16	10.80	105	1,378
			4.0	13.3	8.15	11.00	106	1,393
			5.0 5.5	12.8 12.7	8.13 8.09	11.10 10.80	105 103	1,400 1,399
			Surface	3.1	8.03	11.23	100	1,504
			1.0	3.4	8.08	11.24	100	1,505
			2.0	3.4	8.10	11.24	100	1,505
10-Oct-19	653466	5545942	3.0 4.0	3.3 3.5	8.11 8.11	11.25	100 100	1,506 1,504
		-	5.0	3.5	8.11	11.20 11.17	100	1,504
		-	5.7	3.5	8.11	11.17	100	1,504
			Surface	12.8	8.39	8.95	83	2,010
		-	1.0 2.0	12.8 12.8	8.48 8.48	8.65 8.68	82 81	2,009 2,009
10-Sep-20	653478	5545938	3.0	12.7	8.48	8.40	82	2,010
		-	4.0 5.0	12.4 12.1	8.47 8.45	9.04 9.30	85 87	2,039 2,051
			Surface	10.4	8.34	10.42	111	1,680
00.0 04	050054	5540040	0.5	10.4	8.34	10.35	110	1,680
23-Sep-21	653654	5546040	1.0 1.5	10.3 10.3	8.33 8.34	10.29 10.22	110 109	1,680 1,680
		-	2.0	10.2	8.33	10.44	111	1,680
		-	0.5 1.0	10.1 10.0	8.33 8.33	9.56 9.73	101 102	1,680 1,680
		-	1.5	10.0	8.34	9.65	102	1,680
21 San 21	653481	5545994	2.0 2.5	9.9 9.9	8.33 8.33	9.81 9.55	103 100	1,680 1,680
21-Sep-21	055461	3343994	3.0	9.9	8.33	9.76	103	1,680
			3.5	9.8	8.24	9.71	102	1,680
		-	4.0 4.5	9.5 9.5	8.26 8.27	9.53 9.42	99 98	1,690 1,690
			0.5	10.0	8.28	9.85	103	1,680
			1.0 1.5	10.0 10.0	8.30 8.31	9.86 9.48	104 100	1,680 1,680
21-Sep-21	653681	5545999	2.0	10.0	8.30	9.41	99	1,680
			2.5 3.0	10.0 10.0	8.29 8.29	9.02 9.25	95 97	1,670 1,680
		<u> </u>	3.5	10.0	8.29	8.95	95	1,670
			Surface	10.3	8.33	10.10	108	1,680
			0.5 1.0	10.3 10.3	8.33 8.33	9.95 10.10	106 108	1,680 1,680
			1.5	10.3	8.33	9.95	106	1,680
	_		2.0 2.5	10.3 10.3	8.33 8.33	10.03 10.00	107 107	1,680 1,680
23-Sep-21	653537	5545648	3.0	10.3	8.33	9.95	106	1,680
			3.5	10.3	8.32	9.92	106	1,680
		-	4.0 4.5	10.1 10.0	8.28 8.26	9.87 9.89	105 105	1,680 1,690
			5.0	10.0	8.25	9.84	104	1,690
			5.5 Surface	9.9 10.1	8.22 8.32	9.21 9.75	97 104	1,690 1,680
			0.5	10.1	8.33	9.70	104	1,680
			1.0 1.5	10.1 10.1	8.32 8.32	9.72 9.75	103 104	1,680 1,680
22-Sep-21	653681	5545953	2.0	10.1	8.32	9.75	104	1,680
22-06h-71	000001	JU40800	2.5	10.1	8.31	9.79	104	1,680
			3.0	10.1 10.1	8.30 8.30	9.75 9.77	104 104	1,680 1,680
			4.0	10.1	8.27	9.64	103	1,680
			4.5 Surface	10.0 12.0	8.22 7.97	8.51 9.14	90 85	1,680 1,568
			1.0	12.0	8.00	9.15	85	1,568
19-Sep-22	653459	5545959	2.0	12.0	8.01	9.15	85	1,568
-			3.0 4.0	11.9 11.7	8.01 8.01	9.17 9.34	85 86	1,571 1,573
į –			5.0	11.4	8.01	9.52	88	1,579

## APPENDIX F SUBSTRATE QUALITY

Table F.1: Pebble Counts and Calcite Measurements at RG_GAUT on Upper Gardine Creek, September 2022

		RG_GAUT-1					RG_GAUT-2					RG_GAUT-3		
		14-Sep-22					14-Sep-22					14-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)
1	0	1	1	4.9	1	0	1	0.2	2.5	1	0	0	0	2.6
2	0	1	0.6	2.5	2	0	1	0.2	5.0	2	0	0	0	1.5
3	0	1	0.8	3.9	3	0	1	0.6	4.6	3	0	0	0	1.5
5	0	0	0	2.0 2.2	<u>4</u> 5	0	1	0.2	6 2.2	<u>4</u> 5	0	0	0	2.2 2.0
6	0	0	0	2.7	6	0	1	0.1	4.0	6	0	0	0	3.8
7	0	1	0.3	16.4	7	0	1	1	1.9	7	0	0	0	2.6
8	0	0	0	1.4	8	0	0	0	2.5	8	0	0	0	1.3
9	0	1	1	3.0	9	0	1	1	3.6	9	0	0	0	2.9
10	0	0	0	3.2	10	0	1	0.3	6.1	10	0	0	0	2.3
11	0	0	0	2.8	11	0	1	0.3	10.4	11	0	0	0	1.8
12 13	0	1	0.8 0.2	5.3 7.2	12 13	0	0	0	2.8	12 13	0	0	0	1.6
13	0	0	0.2	4.3	13	0	0	0	2.0 2.9	14	0	0	0	2.3 2.4
15	0	0	0	3.9	15	0	1	0.3	3.0	15	0	0	0	2.3
16	0	1	0.1	7.7	16	0	1	0.8	3.8	16	0	0	0	2.4
17	0	0	0	2.8	17	0	1	0.4	9.5	17	0	0	0	0.8
18	0	0	0	7.8	18	0	0	0	3.0	18	0	0	0	1.4
19	0	1	0.2	10.4	19	0	1	0.3	2.5	19	0	0	0	0.5
20 21	0	1	0.5 1	8.9 2.1	20 21	0	1	0.5	4.2 6.0	20 21	0	0	0	1.8 2.9
22	0	1	1	10.5	22	0	1	0.5	3.8	22	0	0	0	1.4
23	0	0	0	15.6	23	0	1	0.3	8.0	23	0	1	0.1	3.3
24	0	1	0.1	9.3	24	0	1	1	2.2	24	0	0	0	1.4
25	0	0	0	4.0	25	0	1	0.1	7.0	25	0	0	0	1.8
26	0	1	0.2	6.0	26	0	1	0.5	8.0	26	0	0	0	2.2
27	0	1	0.2	9.2	27	0	1	0.1	3.5	27	0	0	0	2.4
28 29	0	1 0	0.3	4.6 2.7	28 29	0	0	0 0.2	2.1 10.0	28 29	0	0	0	1.5 2.0
30	0	1	0.6	7.2	30	0	1	1	3.7	30	0	0	0	1.6
31	0	0	0.0	3.2	31	0	1	0.4	8	31	0	0	0	1.5
32	1	1	0.5	8.1	32	0	1	0.2	5.5	32	0	0	0	1.0
33	0	1	0.4	2.5	33	0	1	1	6.2	33	0	0	0	1.9
34	0	0	0	2.0	34	0	1	0.4	6.0	34	0	0	0	3.5
35	0	1	0.2	16.5	35	0	0	0	3.3	35	0	0	0	1.9
36 37	0	1 0	0.8	2.1 19.1	36 37	0	0	0 0.2	2.5 3.0	36 37	0	0	0	2.7 1.9
38	0	0	0	5.0	38	0	1	0.5	5.2	38	0	0	0	1.9
39	0	0	0	2.1	39	0	0	0.5	2.5	39	0	0	0	1.8
40	0	0	0	5.3	40	0	0	0	2.5	40	0	0	0	1.9
41	0	1	1	5.2	41	0	1	0.4	5.0	41	0	0	0	2
42	0	1	0.3	2.7	42	0	1	1	4.0	42	0	0	0	1.7
43	0	0	0	2.1	43	0	1	0.2	2.8	43	0	0	0	1.8
44 45	0	1	1 0.2	2.1 2.5	44 45	0	0	0	4.4 3.2	44 45	0	0	0	Fines 2.2
46	0	1	0.9	4.1	46	0	1	0.2	4.4	46	0	0	0	1.5
47	0	1	0.8	3.0	47	0	1	0.3	4.5	47	0	0	0	1.5
48	0	1	0.4	4.5	48	0	1	0.7	11.4	48	0	0	0	6.0
49	0	1	0.1	1.8	49	0	1	0.5	15.0	49	0	0	0	4.8
50	0	0	0	2.7	50	0	1	1	2.7	50	0	0	0	2.5
Cc, Cp, and Cp' =	0.04	0.58	0.31	-	Cc, Cp, and Cp' =	0.00	0.78	0.40	-	Cc, Cp, and Cp' =	0.00	0.02	0.00	-
Calcite Index (CI) = 0.62						Calcite Index (CI) =		0.78			Calcite Index (CI) =		0.02	
Calci	te Index Prime (CI') =		0.35		Calcit	te Index Prime (CI') =		0.40		Calcit	e Index Prime (CI') =		0.00	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

c 0 = calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.1: Pebble Counts and Calcite Measurements at RG_GAUT on Upper Gardine Creek, September 2022

Pebblo   Concreted Status   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Ca		RG_GAUT-4					RG_GAUT-5					RG_GAUT-6		
Public   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Concreted Status   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Calcide Presence   Ca		14-Sep-22												
1	e Concreted				Pebble	Concreted Status ^a		•		Pebble	Concreted Status ^a		Proportional Calcite Presence ^c	Intermediate Axis (cm)
S	0	0 0			1	0	0		4.5	1	0	0	0	2.3
4         0         0         4.0         4         0         0         0         5.5         4         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td>0</td> <td>0 0</td> <td>0</td> <td>2.4</td> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>2.8</td> <td>2</td> <td>0</td> <td>0</td> <td>0</td> <td>5.2</td>	0	0 0	0	2.4	2	0	0	0	2.8	2	0	0	0	5.2
6         0         0         0         40         6         0         0         0         330         6         0         0           7         0         0         0         0         0         6         6         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0						-		-		-	-		0	1.6
6         0         0         0         6         6         0         0         0         6         6         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0					-			-		-			0	5.4
77 0 0 0 0 0 3.88 77 0 0 0 0 4.3 77 0 0 0 0 8.88 8 0 0 0 0 0 0 0 0 0 0 0 0						·		-		-			0	4.8
8         0         0         0         2.7         9         0         0         0         5.5         8         0         0           10         0         0         0         2.27         9         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0						-		-		-		The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	2.0
9						·				8		The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	3.7
11					9	0		0		9	0		0	8.8
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32         0         0         0         2.6         32         0         0         0         4.5         32         0         0           33         0         0         0         0         0         4.0         33         0         0           34         0         0         0         0         0         3.4         34         0         0           35         0         0         0         0         0         4.5         35         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0						-		-					0	4.1
34         0         0         2.6         34         0         0         0         3.4         34         0         0           35         0         0         0         0         0         4.5         35         0         0           36         0         0         0         0         0         4.4         36         0         0           37         0         0         0         0         0         2.5         37         0         0           38         0         0         0         0         2.5         37         0         0           39         0         0         0         0         2.5         38         0         0           40         0         0         0         0         0         0         2.5         38         0         0           41         0         0         0         0         0         0         0         0           42         0         0         0         0         0         0         0         0           43         0         0         0         0         0         0	0	0 0	0		32	0	0	0	4.5	32	0	0	0	6.2
35         0         0         12.7         35         0         0         4.5         35         0         0           36         0         0         0         0         0         4.4         36         0         0           37         0         0         0         0         0         2.5         37         0         0           38         0         0         0         0         0         2.5         38         0         0           39         0         0         0         0         0         2.5         38         0         0           40         0         0         0         0         0         8.3         39         0         0           41         0         0         0         0         4.5         40         0         0           42         0         0         0         0         3.4         42         0         0           43         0         0         0         0         0         0         0         0           44         0         0         0         0         0         0         0						·		-					0	fines
36         0         0         14.8         36         0         0         4.4         36         0         0           37         0         0         0         0         0         2.5         37         0         0           38         0         0         0         0         0         2.5         38         0         0           39         0         0         0         0         0         2.5         38         0         0           40         0         0         0         0         8.3         39         0         0           41         0         0         0         0         0         4.5         40         0         0           41         0         0         0         0         5.3         41         0         0           42         0         0         0         0         3.4         42         0         0           43         0         0         0         0         0         0         4.4         43         0         0           44         0         0         0         0         0         5.8 <td></td> <td></td> <td></td> <td></td> <td></td> <td>·</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td>4.0</td>						·							0	4.0
37         0         0         0         3.2         37         0         0         0         2.5         37         0         0           38         0         0         0         0         0         0         2.5         38         0         0           39         0         0         0         0         0         8.3         39         0         0           40         0         0         0         0         4.5         40         0         0           41         0         0         0         0         4.5         40         0         0           42         0         0         0         0         5.3         41         0         0           43         0         0         0         0         3.4         42         0         0           44         0         0         0         0         4.4         43         0         0           44         0         0         0         0         5.8         44         0         0						·		-				-	0	9.0
38         0         0         4.0         38         0         0         0         2.5         38         0         0           39         0         0         0         0         0         0         8.3         39         0         0           40         0         0         0         0         0         4.5         40         0         0           41         0         0         0         0         0         5.3         41         0         0           42         0         0         0         0         3.9         42         0         0         0         3.4         42         0         0           43         0         0         0         0         4.4         43         0         0           44         0         0         0         5.8         44         0         0												The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	1.2
39         0         0         0         4.5         39         0         0         0         8.3         39         0         0           40         0         0         0         0         0         4.5         40         0         0           41         0         0         0         0         0         5.3         41         0         0           42         0         0         0         0         3.4         42         0         0           43         0         0         0         0         4.4         43         0         0           44         0         0         0         5.8         44         0         0						·						The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	3.4
40         0         0         1.8         40         0         0         0         4.5         40         0         0           41         0         0         0         0         0         5.3         41         0         0           42         0         0         0         0         3.4         42         0         0           43         0         0         0         0         4.4         43         0         0           44         0         0         0         5.8         44         0         0						·						The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	8.0
42         0         0         0         3.9         42         0         0         0         3.4         42         0         0           43         0         0         0         0         0         4.4         43         0         0           44         0         0         0         0         5.8         44         0         0						·				40	-		0	5.6
43         0         0         0         3.9         43         0         0         0         4.4         43         0         0           44         0         0         0         0         5.8         44         0         0	-					-						*	0	7.1
44         0         0         0         2.3         44         0         0         0         5.8         44         0         0													0	7.3
													0	2.8
<b>  45</b>   0   0   0   3.7   <b>45</b>   0   0   5.0   <b>45</b>   0   0	0		0	3.7	44	0	0	0	5.0	45	0	0	0	3.2
46         0         0         0         3.9         46         0         0         3         46         0         0													0	8.0
47         0         0         0         2.1         47         0         0         0         2.5         47         0         0													0	3.2
<b>48</b> 0 0 0 0 2.5 <b>48</b> 0 0 0 2.7 <b>48</b> 0 0				2.5					2.7			The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	0	11.0
49         0         0         12.6         49         0         0         0         4.7         49         0         0													0	9.8
50 0 0 0 1.9 50 0 0 0 5.0 50 0 0		0	0	1.9			0	0	5.0		0	0	0	5.8
		.00 0.00	0.00	-		0.00	0.02	0.00	-				0.00	-
Calcite Index (CI) = 0.00 Calcite Index (CI) = 0.02 Calcite Index (CI) =	Calcite Ind	ndex (CI) =	0.00	·		Calcite Index (CI) =		0.02	•		Calcite Index (CI) =		0.00	
Calcite Index Prime (CI') = 0.00 Calcite Index Prime (CI') = 0.00 Calcite Index Prime (CI') =	Calcite Index Prim	rime (CI') =	0.00		Calcit	e Index Prime (CI') =		0.00		Calcit	e Index Prime (CI') =		0.00	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^c 0 = calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.2: Pebble Counts and Calcite Measurements at RG_GANF on Lower Gardine Creek, September 2022

		RG_GANF					RG_GANF					RG_GANF		
		13-Sep-2					13-Sep-22	2				13-Sep-22	2	
		h	Proportional Calcite	Intermediate Axis			h	Proportional Calcite	Intermediate Axis			h	Proportional Calcite	Intermediate Axis
Pebble	Concreted Status ^a	Calcite Presence b	Presence ^c	(cm)	Pebble	Concreted Status ^a	Calcite Presence b	Presence ^c	(cm)	Pebble	Concreted Status ^a	Calcite Presence b	Presence ^c	(cm)
1	0	1	0.6	8.7	1	1	1	1	7.0	1	1	1	1	12.0
2	0	0	0	4.5	2	2	1	1	11.5	2	1	1	0.9	9.2
3	0	1	0.4	9.5	3	2	1	1	calcite	3	1	1	0.8	6.0
4	0	1	0.1	12.5	4	0	1	0.9	2.6	4	2	1	1	10.5
5	0	1	0.4	5.9	5	2	1	1	5.7	5	1	1	0.7	4.0
6	0	1	0.6	6.5	6	2	1	1	8.2	6	0	1	0.9	5.3
7	1	1	0.7	12.5	7	1	1	1	6.7	7	0	1	0.9	10.0
8	1	1	0.6	3.5	8	1	1	1	4.3	8	0	1	0.8	5.3
9	0	1	0.3	21.5	9	0	1	0.8	2.4	9	2	1	1	calcite
10	1	1	0.7	4.5	10	2	1	1	calcite	10	1	1	0.8	calcite
11	0	1	0.7	5.0	11	0	1	0.7	3.9	11	2	1	1	8.0
12	0	1	0.6	5.4	12	0	1	0.4	3.8	12	2	1	1	calcite
13	1	1	0.8	9.5	13	0	1	0.5	2.2	13	2	1	1	11.0
14	1	1	0.6	8.7	14	2	1	1	calcite	14	2	1	1	12.0
15	2	1	1	6.5	15	0	1	1	8.2	15	2	1	1	10.2
16	1	1	0.7	4.3	16	1	1	<u>.</u> 1	5.4	16	2	1	1	calcite
17	0	1	0.7	4.8	17	2	1	<u>·</u> 1	calcite	17	2	1	 1	5.0
18	2	<u>.</u> 1	0.7	4.5	18	1	1	<u>·</u>	9.8	18	2	1	 1	6.4
19	2	1	1	12.5	19	2	1	<u> </u>	calcite	19	2	1	 1	8.2
20	2	1	1	17.4	20	1	1	1	10.7	20	2	1	1	6.7
21	1	1	0.7	8.0	21	1	1	1	8.1	21	2	1	1	15.0
22	2	1	1	10.6	22	2	1	1	calcite	22	2	1	1	11.9
23	2	1	1	12.4	23	2	1	1	9.6	23	2	1	1	14.5
24	2	<u>.</u> 1	1	6.2	24	2	1	1	calcite	24	2	1	 1	10.4
25	0	1	0.5	26.7	25	2	1	<u> </u>	calcite	25	0	1	0.9	9
26	0	1	0.3	3.3	26	2	1	<u>.</u> 1	calcite	26	2	1	1	calcite
27	2	1	1	18.7	27	0	1	0.9	3.1	27	2	1	<u>.</u> 1	10.6
28	2	<u> </u>	0.9	8.2	28	2	1	1	5.8	28	2	1	<u>.</u> 1	calcite
29	2	1	1	11.5	29	2	1	1	calcite	29	2	1	<u>.</u> 1	calcite
30	2	1	1	12.2	30	2	1	1	calcite	30	2	1	<u>.</u> 1	13.0
31	0	1	0.5	4.6	31	1	1	1	5.0	31	2	1	<u> </u>	7.3
32	0	<u> </u>	0.4	4.5	32	2	1	1	calcite	32	2	1	1	15.6
33	2	<u> </u>	1	12.0	33	2	1	1	calcite	33	2	1	1	calcite
34	2	1	1	8.8	34	0	1	0.6	13.7	34	2	1	1	calcite
35	2	1	1	16.2	35	2	1	1	calcite	35	2	1	1	calcite
36	2	1	1	8.0	36	2	1	1	calcite	36	0	1	0.6	7.6
37	2	<u>'</u> 1	1	6.3	37	2	1	1	calcite	37	1	1	0.0	5.0
38	1	1	1	8.0	38	2	1	1	16.7	38	2	1	0.9	calcite
39	2	<u>1</u>	1	10.0	39	2	1	<u></u>	calcite	39	2	1	1	calcite
40	2	<u>'</u> 1	1	10.6	40	1	1	0.9	4.8	40	1	1	1	16.0
41	2	<u></u>	1	12.0	41	2	1	0.9 1	calcite	41	1	1	0.7	11.0
42	2	<u> </u> 1	0.9	7.0	42	2	1	<u></u>	calcite	42	0	1	0.6	9.0
42	0	<u>'</u> 1	0.9	8.5	42	2	1	<u></u>	calcite	42	2	1	1	9.5
43	2	<u> </u> 1	0.7		43	2	1	<u> </u> 1			2	1	<u> </u>	
44		<u>1</u>	0.9	11.2 13.1	44	2	1	<u></u>	calcite calcite	44	0	1	0.8	13.0 11.0
	2	1		6.5	45 46	1	1	1 1		45	2	1	1	
46	0	<u> </u>	0.8			1			9.8	46			•	15.8
47	0		0.8	8.0	47	The second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon	1	1	17.5	47	2	1	0.9	11.9
48	0	1	0.7	6.5	48	2	1	1	calcite	48	2	1	1	18.6
49	0	1	0.6	4.5	49	2	1	1	calcite	49	2	1	1	calcite
50	0	1	1	8.0	50	1	1	1	5.3	50	2	1	1	10.9
Cc, Cp, and Cp' =	1.04	0.98	0.76	-	Cc, Cp, and Cp' =	1.44	1.00	0.95	-	Cc, Cp, and Cp' =	1.56	1.00	0.94	-
	Calcite Index (CI) =		2.02			Calcite Index (CI) =		2.44			Calcite Index (CI) =		2.56	
Calcit	te Index Prime (CI') =		1.80		Calci	te Index Prime (CI') =		2.39		Calci	te Index Prime (CI') =		2.50	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.2: Pebble Counts and Calcite Measurements at RG_GANF on Lower Gardine Creek, September 2022

		RG_GANF					RG_GANF					RG_GANF-		
	1	13-Sep-2		-			13-Sep-22		T -			13-Sep-22		1 -
Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite	Intermediate Axis	Pebble	Concreted Status a	Calcite Presence b	Proportional Calcite	Intermediate Axis	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite	Intermediate Axis
1		1	Presence c	( <b>cm</b> ) 9.5	1	2	4	Presence c	(cm)	1	2	1	Presence c	(cm) calcite
2	2	1	1	10.0	2	2	1	<u> </u> 	calcite calcite	2	1	1	<u> </u> 1	9.0
3	2	1	1	13.6	3	2	1	1	calcite	3	2	1	1	5.7
4	1	1	0.6	17.0	4	1	1	1	9.1	4	2	1	<u>'</u> 1	5.5
5	1	1	1	9.2	5	2	1	<u> </u>	16.4	5	2	1	<u> </u>	calcite
6	2	1	1	13.2	6	1	1	<u> </u>	4.1	6	0	1	0.5	4.7
7	1	1	0.8	9.5	7	2	1	1	calcite	7	0	1	0.4	3.4
8	2	1	1	9.0	8	2	1	1	calcite	8	2	1	1	8.2
9	2	1	1	15.3	9	2	1	1	calcite	9	2	1	1	calcite
10	2	1	1	12.8	10	2	1	1	calcite	10	1	1	1	8.3
11	2	1	1	18.0	11	0	1	1	14.0	11	2	1	1	calcite
12	1	1	0.7	6.0	12	2	1	1	18.2	12	2	1	1	calcite
13	0	1	0.6	5.7	13	2	1	1	calcite	13	2	1	1	calcite
14	1	1	1	8.3	14	2	1	1	calcite	14	2	1	1	calcite
15	0	1	0.7	5.0	15	1	1	1	14.3	15	0	1	0.8	4.4
16	0	1	0.5	6.4	16	2	1	1	12.8	16	1	1	0.9	7.2
17	0	1	0.6	4.4	17	0	1	<del>-</del>	4.0	17	2	1	1	25.8
18	2	1	1	12.7	18	0	1	1	3.8	18	2	1	1	calcite
19	0	1	0.5	15.3	19	2	1	1	calcite	19	1	1	1	7.1
20	2	1	1	8.5	20	1	1	1	3.7	20	1	1	1	10.4
21	0	1	0.5	6.6 3.4	21	2	1	1 1	calcite	21	0	1	0.9	6.1
22 23	0	<u> </u>	0.5		22 23	1	1	<u></u>	4.5	22	1	1	0.8	2.9 20.6
24	2	1	0.4	7.8 calcite	24	2	1	<u></u>	7.6	23 24	·	1	1	4.8
25	0	1	0.6	9.0	25	2	1	<u> </u>	calcite calcite	25	2	1	<u> </u>	2.7
26	2	<u>'</u> 1	1	calcite	26	0	1	<u></u>	15.4	26	2	1	1	calcite
27	0	1	0.7	8.0	27	2	1	<u>'</u> 1	10.0	27	2	1	1	calcite
28	0	1	0.8	8.5	28	2	1	<u>'</u> 1	calcite	28	2	1	1	calcite
29	1	1	0.9	5.5	29	2	1	1	calcite	29	2	1	<u> </u> 1	calcite
30	0	1	0.5	5.3	30	1	-	-	4.2	30	2	1	<u> </u>	calcite
31	0	1	0.6	7.5	31	1	1	1	4.7	31	2	1	1	3.5
32	0	1	0.7	2.4	32	0	1	1	3.3	32	0	1	1	calcite
33	0	1	0.7	2.3	33	2	1	1	calcite	33	2	1	1	calcite
34	0	1	0.5	6.0	34	2	1	1	calcite	34	2	1	1	calcite
35	1	1	1	6.8	35	2	1	1	calcite	35	1	1	1	5.8
36	0	1	0.4	7.7	36	2	1	1	calcite	36	2	1	1	calcite
37	1	1	0.9	4.7	37	2	1	1	calcite	37	1	1	1	8.0
38	0	1	0.9	6.0	38	0	1	1	2.3	38	2	1	1	calcite
39	2	1	1	calcite	39	1	1	1	4.1	39	1	1	0.9	2.2
40	1	1	0.6	10.5	40	2	1	1	calcite	40	2	1	1	11.0
41	1	1	0.9	5.5	41	2	1	1	calcite	41	2	1	1	calcite
42	1	1	0.6	10.2	42	2	1	1	calcite	42	2	1	1	calcite
43	0	1	0.8	8.5	43	2	1	1	17.5	43	2	1	1	calcite
44	2	1	1	9	44	2	1	1	8.4	44	2	1	1	calcite
45	2	1	1	calcite	45	2	1	1	5.0	45	1	1	1	3.9
46	1	1	0.7	9.0	46	1	1	1	3.7	46	0	1	0.9	4.0
47	1	1	0.7	12.0 5.5	47	2	1	1	calcite	47	0	1	1	9.2 5.3
48	1	<u> </u>	0.6	5.5 calcite	48 49		1	<u> </u>	8.6 5.9	48 49		1	0.9	5.0
49 50	2	1	0.5	5.8	50	0	1	1 1	6.7	50	0	1	0.9 1	7.6
Cc, Cp, and		1.00	0.78		Cc, Cp, and	-	0.98	0.96		Cc, Cp, and		1.00	0.96	-
	Calcite Index (CI) =		1.92		-	Calcite Index (CI) =		2.46		•	Calcite Index (CI) =		2.36	
Calci	ite Index Prime (CI') =		1.70		Calc	ite Index Prime (CI') =		2.44		Calci	te Index Prime (CI') =		2.32	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.3: Pebble Counts and Calcite Measurements at RG_GHUT on Upper Greenhills Creek, September 2022

		RG_GHUT-1					RG_GHUT-2					RG_GHUT-3		
Pebble	Concreted Status ^a	15-Sep-22  Calcite Presence ^b	Proportional	Intermediate Axis	Pebble	Concreted Status ^a	15-Sep-22  Calcite Presence ^b	Proportional	Intermediate Axis	Pebble	Concreted Status ^a	15-Sep-22  Calcite Presence ^b	Proportional	Intermediate Axis
			Calcite Presence c	(cm)			4	Calcite Presence c	(cm)		2		Calcite Presence c	(cm)
1 	0	<u> </u>	1	4.2 1.3	1 2	2 2	1	1	calcite calcite	1 2	2 2	1	1	calcite calcite
3	0	1	1	14.8	3	0	1	1	3.0	3	2	1	1	calcite
4	0	1	1	5	4	2	1	1	calcite	4	2	1	1	calcite
5	2	1	1	calcite	5	0	0	0	fines	5	2	1	1	calcite
6	2	1	1	calcite	6	2	1	1	calcite	6	2	1	1	calcite
7	0	1	1	3.5	7	0	1	0.9	3.8	7	2	1	1	calcite
8	1	1	1	15.7	8	2	1	1	7	8	2	1	1	calcite
9	2	1	1	calcite	9	0	1	1	7.0	9	2	1	1	calcite
10	2	1	1	calcite	10	0	1	1	calcite	10	2	1	1	calcite
11	2	1	1	calcite	11	0	1	1	11.3	11	2	1	1	calcite
12	2	1	1	calcite	12	2	1	1	calcite	12	2	1	1	calcite
13	2	1	1	calcite	13	0	0	0	fines	13	2	1	1	calcite
14	2	1	1	calcite	14	0	1	0.1	3.6	14	2	1	1	5.0
15	2	1	1	calcite	15	2	1	1	calcite	15	2	1	1	calcite
16	2	1	1	calcite	16	2	1	1	calcite	16	2	1	1	calcite
17	2	1	1	calcite	17	1	1	1	3.0	17	2	1	1	calcite
18	2	1	1	calcite	18	2	1	1	calcite	18	2	1	1	calcite
19	2	1	1	calcite	19	0	1	1	6.2	19	2	1	1	calcite
20 21	2	<u> </u>	1	calcite 2.0	20 21	1 2	1	0.7	5 calcite	20 21	2 2	1	1	calcite calcite
22	0	1	1	3.5	22	1	1	1	5.3	22	2	1	1	calcite
23	2	1	1	calcite	23	2	1	1	calcite	23	2	1	1	calcite
24	2	1	1	calcite	24	1	1	1	6.5	24	2	1	1	calcite
25	2	1	1	calcite	25	2	1	1	calcite	25	2	1	1	calcite
26	0	1	1	8.6	26	2	1	1	calcite	26	2	1	1	calcite
27	2	1	1	calcite	27	1	1	1	2.5	27	2	1	1	calcite
28	2	1	1	calcite	28	1	1	1	1.5	28	2	1	1	calcite
29	2	1	1	calcite	29	2	1	1	calcite	29	2	1	1	calcite
30	2	1	1	calcite	30	2	1	1	calcite	30	2	1	1	calcite
31	2	1	1	calcite	31	2	1	1	calcite	31	2	1	1	calcite
32	0	1	1	3	32	2	1	1	calcite	32	2	1	1	calcite
33	0	1	1	4	33	2	1	1	calcite	33	2	1	1	calcite
34	2	1	1	calcite	34	2	1	1	calcite	34	2	1	1	calcite
35	0	1	1	7.9	35	2	1	1	calcite	35	2	1	1	calcite
36	2	1	1	calcite	36	2	1	1	calcite	36	2	1	1	calcite
37	2	1	1	calcite	37	2	1	1	calcite	37	1	1	1	2.0
38	2	<u> </u>	1	calcite	38	2	1	1	calcite	38	1	1	1	3.8
39	2	1	1	calcite	39 40	2	1	1	3	39 40	2	· ·	1	calcite
40 41	2 2	1	1	calcite calcite	40 41	2	1	1	calcite calcite	40 41	2 2	1	1	calcite calcite
41	1	1	1	13	41	0	1	1	Calcile 4	41	2	1	1	calcite
43	0	1	1	3.7	43	0	0	0	fines	43	2	1	1	calcite
44	2	1	1	calcite	44	2	1	1	calcite	44	2	1	1	calcite
45	1	1	1	8.0	45	2	1	1	calcite	45	2	1	1	calcite
46	0	1	1	8.6	46	2	1	1	calcite	46	2	1	1	calcite
47	2	1	1	calcite	47	2	1	1	calcite	47	2	1	1	calcite
48	2	1	1	calcite	48	0	0	0	fines	48	2	1	1	calcite
49	2	1	1	calcite	49	2	1	1	calcite	49	2	1	1	calcite
50	0	1	1	11.6	50	1	1	1	8.0	50	2	1	1	calcite
Cc, Cp, and Cp' =	1.38	1.00	1.00	-	Cc, Cp, and Cp' =	1.36	0.92	0.89	-	Cc, Cp, and Cp' =	1.96	1.00	1.00	-
	Calcite Index (CI) =		2.38	1	*	Calcite Index (CI) =		2.28	·	•	Calcite Index (CI) =		2.96	1
	e Index Prime (CI') =		2.38		Calci	te Index Prime (CI') =		2.25		Calci	ite Index Prime (CI') =		2.96	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.3: Pebble Counts and Calcite Measurements at RG_GHUT on Upper Greenhills Creek, September 2021

		RG_GHUT-4					RG_GHUT-5					RG_GHUT-6		
	1	15-Sep-22	1	T		T	15-Sep-22					15-Sep-22	1	
Pebble	Concreted Status ^a	Calcite Presence b	Proportional  Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional  Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional  Calcite Presence c	Intermediate Axis (cm)
1	2	1	1	calcite	1	2	1	1	calcite	1	0	1	1	5.5
2	2	1	1	calcite	2	2	1	1	calcite	2	2	1	1	calcite
3	2	1	1	calcite	3	2	1	1	calcite	3	0	1	1	7.5
4	2	1	1	calcite	4	0	1	1	9.2	4	2	1	1	calcite
5	2	1	1	calcite	5	1	1	1	3.0	5	2	1	1	calcite
6	2	1	1	calcite	6	0	1	0.9	4.2	6	2	1	1	calcite
7	2	1	1	calcite	7	0	1	1	4.5	7	2	1	1	calcite
<u>8</u> 9	2 2	<u> </u>	1	calcite calcite	8 9	2	1	1	calcite 8.7	<u>8</u> 9	2 2	1	1	calcite calcite
10	0	<u> </u> 	0.8	9.0	10	0	1	1	3.4	10	2	1	1	calcite
11	2	<u></u>	1	calcite	11	0	1	1	3.0	11	2	1	1	calcite
12	0	<u> </u>	0.5	7.5	12	0	1	1	5.7	12	2	1	1	calcite
13	2	1	1	calcite	13	0	1	1	4.5	13	2	1	1	calcite
14	2	<u>.</u> 1	1	calcite	14	1	1	1	4.5	14	2	1	1	calcite
15	0	1	0.9	3.7	15	0	1	1	4.2	15	2	1	1	calcite
16	0	1	0.2	3.5	16	1	1	1	5.0	16	1	1	1	5.8
17	2	1	1	calcite	17	0	1	1	3.6	17	1	1	1	5.6
18	2	1	1	calcite	18	2	1	1	calcite	18	2	1	1	calcite
19	0	1	0.9	11.8	19	0	1	1	10.8	19	2	1	1	calcite
20	2	1	1	calcite	20	2	1	1	calcite	20	2	1	1	calcite
21	2	1	1	calcite	21	2	1	1	calcite	21	2	1	1	calcite
22	2	1	1	calcite	22	2	1	1	calcite	22	2	1	1	calcite
23	2	1	1	calcite	23	0	1	0.7	3.5	23	1	1	1	1.4
24	2	1	1	calcite	24	2	1	1	calcite	24	2	1	1	calcite
25	2	1	1	calcite	25	2	1	1	calcite	25	2	1	1	calcite
26	2	1	1	calcite	26	2	1	1	calcite	26	2	1	1	calcite
27	2	11	1	calcite	27	2	1	1	calcite	27	2	1	1	calcite
28	0	<u> </u>	0.2	6.0	28	1	1	1	7.8	28	2	1	1	calcite
29	2	1	1	calcite	29	2	1	1	3.5	29	2	1	1	calcite
30 31	2	1	1	calcite	30	2	1	1	calcite	30	2	1	1	calcite
31 32	2 2	1 1	1	calcite calcite	31 32	2	1	1	calcite calcite	31 32	2 2	1	1	calcite
33	2	<u> </u> 1	1	calcite	33	2	1	1	calcite	33	2	1	1	calcite calcite
34	2	<u> </u> 1	1	calcite	34	2	1	1	calcite	34	2	1	1	calcite
35	2	<u>'</u> 1	1	calcite	35	2	1	1	calcite	35	2	1	1	calcite
36	2	1	1	calcite	36	2	1	1	calcite	36	2	1	1	calcite
37	2	1	1	calcite	37	2	1	1	calcite	37	2	1	1	calcite
38	2	<u> </u>	1	calcite	38	2	1	1	calcite	38	2	1	1	calcite
39	1	<u>.</u> 1	1	1.2	39	2	1	1	calcite	39	2	1	1	calcite
40	2	1	1	calcite	40	2	1	1	calcite	40	2	1	1	calcite
41	2	1	1	calcite	41	2	1	1	calcite	41	2	1	1	calcite
42	2	1	1	calcite	42	2	1	1	calcite	42	1	1	1	2.8
43	2	1	1	calcite	43	0	1	1	5.2	43	0	1	1	2.6
44	2	1	1	calcite	44	1	1	1	5.6	44	2	1	1	calcite
45	2	1	1	calcite	45	0	1	1	6.0	45	2	1	1	calcite
46	0	1	1	2.2	46	0	1	0.9	3.3	46	0	1	1	3.2
47	2	1	1	calcite	47	0	1	1	1.8	47	2	1	1	calcite
48	2	1	1	calcite	48	2	1	1	calcite	48	2	1	1	calcite
49	2	1	1	calcite	49	1	1	1	4.2	49	2	1	1	calcite
50	2	1	1	calcite	50	2	1	1	calcite	50	2	1	1	calcite
Cc, Cp, and Cp' =	1.70	1.00	0.95	-	Cc, Cp, and Cp' =	1.24	1.00	0.99	-	Cc, Cp, and Cp' =	1.70	1.00	1.00	-
	Calcite Index (CI) =		2.70			Calcite Index (CI) =		2.24			Calcite Index (CI) =		2.76	
Calcite	e Index Prime (CI') =	<del></del>	2.65		Calci	te Index Prime (CI') =		2.23		Calc	ite Index Prime (CI') =		2.76	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.4: Pebble Counts and Calcite Measurements at RG_GHNF on Upper Greenhills Creek, September 2022

		RG_GHNF-1					RG_GHNF-2					RG_GHNF-3		
		09-Sep-22					09-Sep-22					10-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)
1	2	1	1	calcite	1	0	1	1	7.0	1	2	1	1	calcite
2	1	1	1	4.2	2	1	1	1	8.5	2	1	1	1	2.0
3	1	1	1	3.0	3	0	1	1	4.4	3	2	1	1	calcite
4	2	1	1	calcite	4	1	1	1	3.2	4	1	1	1	2.3
5	2	1	1	calcite	5	2	1	1	calcite	5	2	11	1	calcite
6	2	1	1 1	calcite	7	0	1	1	12 3.8	6	2	1 1	1	calcite 1.5
8	2 2	1	1	calcite calcite	8	1	1	1	7.8	8	2	<u></u>	1	calcite
9	2	1	1	calcite	9	2	1	1	calcite	9	2	1	1	calcite
10	2	1	1	calcite	10	1	1	1	8	10	2	<u>·</u> 1	1	calcite
11	1	1	1	2.5	11	0	1	1	3.0	11	2	1	1	calcite
12	1	1	1	4	12	2	1	1	calcite	12	0	1	1	4.4
13	1	1	1	5.5	13	2	1	1	calcite	13	2	1	1	calcite
14	2	1	1	calcite	14	2	1	1	calcite	14	2	11	1	calcite
15	1	1	1	3.4	15	2	1	1	calcite	15	1	1	1	10
16	1	1	1	7.2	16	2	1	1	calcite	16	2	1	1	calcite
17 18	2 2	1	1	calcite calcite	17 18	2 2	1	1	calcite calcite	17 18	2 2	<u>1</u> 1	1	calcite calcite
19	1	1	1	4.5	19	2	1	1	calcite	19	2	1	1	calcite
20	2	1	1	calcite	20	1	1	1	4	20	2	<u> </u>	1	calcite
21	2	1	1	calcite	21	1	1	1	3.5	21	0	 1	1	6.8
22	2	1	1	calcite	22	2	1	1	calcite	22	2	1	1	calcite
23	1	1	1	3.5	23	0	1	1	3.5	23	2	1	1	calcite
24	1	1	1	5.0	24	2	1	1	calcite	24	2	1	1	calcite
25	1	1	1	5.0	25	2	1	1	calcite	25	1	11	1	2.5
26	1	1	1	9.5	26	2	1	1	calcite	26	2	1	1	calcite
27 28	2	1	1 1	calcite	27 28	2 2	1	1	calcite	27	0	<u>1</u> 1	1	3.8 calcite
28	2	1	1	calcite 3.7	29	1	1	1	calcite 5.0	28 29	2 2	<u></u>	1	calcite
30	2	1	1	calcite	30	2	1	1	calcite	30	1	<u>'</u> 1	1	9.5
31	2	1	1	calcite	31	1	1	1	2.3	31	0	<u>·</u> 1	1	2.4
32	2	1	1	calcite	32	2	1	1	calcite	32	0	1	1	1.5
33	1	1	1	5.5	33	1	1	1	6.5	33	1	1	1	6
34	1	1	1	10.5	34	2	1	1	calcite	34	2	1	1	calcite
35	2	1	1	calcite	35	1	1	1	6.5	35	2	1	1	calcite
36	1	1	1	5.3	36	2	1	1	calcite	36	0	1	0.9	14
37	1	1	1	4.6	37 38	2	1	1	calcite	37	1	<u>1</u> 1	0.8	6.5
38 39	2	1	1	calcite calcite	38	2 2	1	1	calcite calcite	38 39	0	1	1	3.0 2.0
40	2	1	1	calcite	40	2	1	1	calcite	40	1	<u></u>	1	3.3
41	2	1	1	calcite	41	2	1	1	calcite	41	2	<u>.</u> 1	1	calcite
42	2	1	1	calcite	42	2	1	1	calcite	42	1	1	1	3.5
43	1	1	1	18.5	43	1	1	1	7.8	43	0	1	1	10.0
44	1	1	1	5.1	44	2	1	1	calcite	44	1	1	1	8.2
45	2	1	1	calcite	45	2	1	1	calcite	45	1	1	1	3.5
46	1	1	1	2.5	46	1	1	1	2.5	46	2	1	1	calcite
47 48	2	1 1	1	calcite	47 48	1	1	1	6	47 48	0	<u>1</u> 1	1	3.1
48 49	2	1	1	calcite 4	48	1 2	1	1	4.7 calcite	48	2 2	1	1	calcite calcite
50	1	1	1	10	50	2	1	1	calcite	50	2	<u></u>	1	calcite
Cc, Cp, and Cp'	·	1.00	1.00	-	Cc, Cp, and Cp		1.00	1.00	-	Cc, Cp, and Cp		1.00	0.99	-
=	Calcite Index (CI) =		2.54		=	Calcite Index (CI) =		2.50		=	Calcite Index (CI) =		2.36	
	e Index Prime (Cl') =		2.54		Calait	te Index Prime (CI') =		2.50		Calair	te Index Prime (CI') =		2.35	
Carciti	= maex Fillie (Ci ) =		4.04		Calcii	te muex Fillie (Ci ) =		2.30		Calci	te muex Fillie (CI) =		2.33	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.4: Pebble Counts and Calcite Measurements at RG_GHNF on Upper Greenhills Creek, September 2022

		RG_GHNF-4					RG_GHNF-5					RG_GHNF-6		
		10-Sep-22					10-Sep-22					10-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence	Intermediate Axis (cm)
1	1	1	1	4.5	1	2	1	1	calcite	1	2	1	1	calcite
2	2	1	1	calcite	2	1	1	1	3.3	2	2	1	1	calcite
3	0	1	1	9.5	3	2	1	1	calcite	3	2	1	1	calcite
4	1	1	1	13.3	4	1	1	1	4.4	4	1	1	1	9.8
5	2	1	1	calcite	5	2	1	1	calcite	5	0	1	1	4.5
6	1	1	1	4	6	1	1	1	4.0	6	1	1	1	4.5
7 8	1 2	<u> </u>	1	11.5 calcite	7 8	2	1	1	calcite 2.3	7 8	2 2	1	1	calcite calcite
9	2	1	1	calcite	9	2	1	1	calcite	9	1	1	1	12.4
10	2	1	1	calcite	10	2	1	1	calcite	10	1	1	1	2.5
11	1	1	1	6.0	11	2	1	1	calcite	11	2	1	1	calcite
12	1	1	1	3	12	1	1	1	5.7	12	1	1	1	5.8
13	1	1	1	3.5	13	2	1	1	calcite	13	2	1	1	calcite
14	2	1	1	calcite	14	2	1	1	calcite	14	2	1	1	calcite
15	1	1	1	3.5	15	2	1	1	calcite	15	2	1	1	calcite
16	0	11	1	11.5	16	2	1	1	calcite	16	0	1	1	5.5
17 18	0	1	1	6.0	17 18	2 2	1	1	calcite	17	1 2	1	1	3.0
19	1	<u> </u>	1	6.5	19	1	1	1	calcite 1.5	18 19	2	1	1	calcite calcite
20	2	1	1	calcite	20	2	1	1	calcite	20	1	1	1	6.5
21	2	1	1	calcite	21	1	1	1	1	21	0	1	1	4.5
22	2	1	1	calcite	22	0	1	1	2.8	22	2	1	1	calcite
23	2	1	1	calcite	23	2	1	1	calcite	23	2	1	1	calcite
24	1	1	1	11	24	2	1	1	calcite	24	2	1	1	calcite
25	2	1	1	calcite	25	2	1	1	calcite	25	1	1	1	8.0
26	2	1	1	calcite	26	2	1	1	calcite	26	2	1	1	calcite
27	1	1	1	11.0	27	1	1	1	2	27	2	1	1	calcite
28	1	11	1	15	28	2	1	1	calcite	28	2	1	1	calcite
29 30	2	<u> </u>	1	calcite 7.5	29 30	2	1	1	calcite 2.5	29 30	1 2	1	1	5.2 calcite
31	2	1	1	calcite	31	2	1	1	calcite	31	2	1	1	calcite
32	2	1	1	calcite	32	1	1	1	1.6	32	1	1	1	5.7
33	1	1	1	10.0	33	2	1	1	calcite	33	2	1	1	calcite
34	2	1	1	calcite	34	2	1	1	calcite	34	1	1	1	3.3
35	2	1	1	calcite	35	1	1	1	2.8	35	2	1	1	calcite
36	1	1	1	6	36	2	1	1	calcite	36	2	1	1	calcite
37	0	1	1	4.8	37	2	1	1	calcite	37	2	1	1	calcite
38	2	1	1	calcite	38	2	1	1	calcite	38	1	1	1	7.5
39 40	2 2	1	1	calcite	39 40	2	1	1 1	calcite 3.7	39 40	1	1	1	6.2 2.4
40	1	<u> </u>	1	calcite 10.5	40	1	1	1	1.8	40	2	1	1	2.4 calcite
42	2	1	1	calcite	42	2	1	1	calcite	42	1	1	1	4
43	1	1	1	4.3	43	2	1	1	calcite	43	2	1	1	calcite
44	1	1	1	10.0	44	0	1	1	3.5	44	2	1	1	calcite
45	2	1	1	calcite	45	2	1	1	calcite	45	1	1	1	7.6
46	1	1	1	7.8	46	0	1	1	fines	46	2	1	1	calcite
47	1	1	1	10.2	47	2	1	1	calcite	47	1	1	1	7.0
48	2	11	1	calcite	48	2	1	1	calcite	48	2	1	1	calcite
49	2	1	1	calcite	49	2	1	1	calcite	49	2	1	1	calcite
Co Co and	2	1	1	calcite	Co Co and	0	1	1	fines	50	2	1	1	calcite
Cc, Cp, and Cp' =	1.42	1.00	1.00	-	Cc, Cp, and Cp' =	1.58	1.00	1.00	-	Cc, Cp, and Cp' =	1.54	1.00	1.00	-
•	Calcite Index (CI) =		2.42		-	Calcite Index (CI) =		2.58		-	Calcite Index (CI) =		2.54	•
Calcite Index Prime (Cl') = 2.42					Calcit	e Index Prime (CI') =		2.58		Calcit	e Index Prime (CI') =		2.54	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^c 0 = calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.5: Pebble Counts and Calcite Measurements at RG_GHDT on Upper Greenhills Creek, September 2022

		RG_GHDT-1					RG_GHDT-2					RG_GHDT-3		
		16-Sep-22					16-Sep-22					16-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)
1	2	1	1	calcite	1	2	1	1	calcite	1	2	1	1	calcite
2	0	1	1	4.0	2	1	1	1	1.6	2	1	1	1	1.7
3	2	1	1	calcite	3	2	1	1	calcite	3	0	1	0.9	7.3
4	2	1	1	calcite	4	2	1	1	calcite	4	0	1	1	5.5
5	2	1	1	calcite	5	2	1	1	calcite	5	2	1	1	calcite
<u>6</u> 7	2 2	1	1	calcite calcite	6 7	2 2	1	1	calcite calcite	6 7	2 2	1	1	calcite calcite
8	0	1	1	5.4	8	2	1	1	calcite	8	0	1	1	5.0
9	2	1	1	calcite	9	2	1	1	calcite	9	2	1	1	calcite
10	2	1	1	calcite	10	2	1	1	calcite	10	2	1	1	calcite
11	0	1	1	6.3	11	2	1	1	3.9	11	2	1	1	calcite
12	2	1	1	calcite	12	2	1	1	calcite	12	2	1	1	calcite
13	2	1	1	calcite	13	2	1	1	calcite	13	2	1	1	calcite
14	2	1	1	calcite	14	2	1	1	calcite	14	2	1	1	calcite
15	2	1	1	calcite	15	2	1	1	calcite	15	2	1	1	calcite
16	0	1	1	6.5	16	2	1	1	calcite	16	1	1	1	6.2
17 18	2 2	1	1	calcite calcite	17 18	2 2	1	1	calcite calcite	17 18	2 0	1	1	calcite 5.4
19	2	1	1	calcite	19	2	1	1	calcite	19	2	1	1	calcite
20	2	1	1	calcite	20	2	1	1	calcite	20	2	1	1	calcite
21	2	1	1	calcite	21	2	1	1	calcite	21	2	1	1	calcite
22	2	1	1	calcite	22	2	1	1	calcite	22	2	1	1	calcite
23	2	1	1	calcite	23	2	1	1	calcite	23	2	1	1	calcite
24	0	1	1	7.0	24	2	1	1	calcite	24	2	1	1	calcite
25	2	1	1	calcite	25	2	1	1	calcite	25	2	1	1	calcite
26	2	1	1	calcite	26	1	1	1	2.2	26	2	1	1	calcite
27	1	1	1	4.3	27	2	1	1	calcite	27	2	1	1	calcite
28 29	2	1	1	calcite 7.0	28 29	2 2	1	1	calcite calcite	28 29	2 0	1	1	calcite 5.2
30	0	1	0.8	4.0	30	2	1	1	calcite	30	2	1	1	calcite
31	2	1	1	calcite	31	2	1	1	calcite	31	2	1	1	calcite
32	2	1	1	calcite	32	2	1	1	calcite	32	2	1	1	calcite
33	2	1	1	calcite	33	2	1	1	calcite	33	2	1	1	calcite
34	2	1	1	calcite	34	2	1	1	calcite	34	2	1	1	calcite
35	2	1	1	calcite	35	2	1	1	calcite	35	1	1	1	7.5
36	2	1	1	calcite	36	2	1	1	calcite	36	0	1	0.7	4.3
37	2	1	1	calcite	37	2	1	1	calcite	37	1	1	1	7.4
38 39	2	1	1	calcite 2.5	38 39	2 2	1	1	calcite	38 39	2 0	1	1	calcite 6.8
39 40	0 2	1	1	2.5 calcite	39 40	2	1	1	calcite calcite	39 40	2	1	0.7	6.8 calcite
40	2	1	1	calcite	41	2	1	1	calcite	41	2	1	1	calcite
42	2	1	1	calcite	42	2	1	1	calcite	42	2	1	1	calcite
43	2	1	1	calcite	43	2	1	1	calcite	43	2	1	1	calcite
44	2	1	1	calcite	44	2	1	1	calcite	44	2	1	1	calcite
45	2	1	1	calcite	45	2	1	1	calcite	45	2	1	1	calcite
46	0	1	1	3.2	46	2	1	1	calcite	46	2	1	1	calcite
47	2	1	1	calcite	47	2	1	1	calcite	47	2	1	1	calcite
48	2	1	1	calcite	48	2	1	1	calcite	48	2	1	1	calcite
49	1	1	0.9	10.5	49	2	1	1	calcite	49	1	1	1	6.5
Cc Cp and	1	1	1	3.9	50 Cc, Cp, and	2	1	1	calcite	50 Cc Cn and	2	1	1	calcite
Cc, Cp, and Cp' =	1.60	1.00	0.99	-	Cc, Cp, and Cp' =	1.96	1.00	1.00	-	Cc, Cp, and Cp' =	1.02	1.00	0.99	-
	Calcite Index (CI) =		2.60			Calcite Index (CI) =		2.96			Calcite Index (CI) =		2.62	
Calcit	e Index Prime (CI') =		2.59		Calci	ite Index Prime (CI') =		2.96		Calc	ite Index Prime (CI') =		2.61	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.5: Pebble Counts and Calcite Measurements at RG_GHDT on Upper Greenhills Creek, September 2022

		RG_GHDT-4					RG_GHDT-5					RG_GHDT-6		
		16-Sep-22					16-Sep-22					16-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)
1	2	1	1	calcite	1	2	1	1	calcite	1	2	1	1	12.9
2	2	1	1	calcite	2	2	1	1	calcite	2	1	1	1	5.8
3	2	1	1	calcite	3	2	1	1	calcite	3	2	1	1	calcite
4	2	1	1	calcite	4	2	1	1	calcite	4	0	1	1	7.9
5	2	1	1	calcite	5	1	1	1	5.3	5	2	11	1	calcite
6 7	1	1	1 1	5.0	6 7	2 2	1	1	calcite	6 7	2	<u>1</u> 1	1	calcite
8	2 2	1	1	calcite calcite		2	1	1	calcite calcite	8	2 2	<u></u>	1 1	calcite calcite
9	2	1	1	calcite	9	2	1	1	calcite	9	2	<u>'</u> 1	1	calcite
10	2	1	1	calcite	10	2	1	1	calcite	10	2	<u> </u>	1	calcite
11	2	1	1	calcite	11	2	1	1	calcite	11	2	1	1	calcite
12	1	1	1	4.7	12	0	1	1	3.0	12	2	1	1	calcite
13	2	1	1	calcite	13	2	1	1	calcite	13	2	1	1	calcite
14	2	1	1	calcite	14	2	1	1	calcite	14	2	1	1	calcite
15	2	1	1	calcite	15	2	1	1	calcite	15	1	1	0.9	3.0
16	2	1	1	calcite	16	2	1	1	calcite	16	2	1	1	calcite
17 18	2 2	1	1 1	calcite calcite	17 18	2 2	1	1	calcite calcite	17 18	2 2	<u>1</u> 1	1 1	calcite calcite
19	2	1	1	calcite	19	2	1	1	calcite	19	2	<u></u>	1	calcite
20	2	1	1	calcite	20	2	1	1	calcite	20	2	<u> </u>	1	calcite
21	2	1	1	calcite	21	2	1	1	calcite	21	1	<u>·</u> 1	0.3	1.6
22	2	1	1	calcite	22	2	1	1	calcite	22	2	1	1	calcite
23	2	1	1	calcite	23	2	1	1	calcite	23	2	1	1	calcite
24	2	1	1	calcite	24	2	1	1	calcite	24	0	1	0.7	1.0
25	2	1	1	calcite	25	2	1	1	calcite	25	2	1	1	calcite
26	2	1	1	calcite	26	2	1	1	calcite	26	2	1	1	calcite
27	2	1	1	calcite	27	2	1	1	calcite	27	2	1	1	calcite
28 29	2	1	1	calcite	28	2	1	1	calcite	28	2	<u> </u>	1	calcite
30	2	1	1	2.4 calcite	29 30	2 2	1	1	calcite calcite	29 30	0	<u></u>	0.9	9.0 12.5
31	2	1	1	calcite	31	2	1	1	calcite	31	2	<u></u>	1	calcite
32	2	1	1	calcite	32	2	1	1	calcite	32	2	<u> </u>	1	calcite
33	2	1	1	calcite	33	2	1	1	calcite	33	0	1	1	6.2
34	2	1	1	calcite	34	1	1	1	10.5	34	2	1	1	calcite
35	1	1	1	3.3	35	1	1	0.7	10.0	35	2	1	1	calcite
36	2	1	1	calcite	36	2	1	1	calcite	36	2	1	1	calcite
37	0	1	1	2.1	37	2	1	1	calcite	37	2	1	1	calcite
38	2	1	1	calcite	38	2	1	1	calcite	38	2	1	1	calcite
39 40	2 2	1	1 1	calcite calcite	39 40	2 2	1	1	calcite calcite	39 40	2	<u>1</u> 1	1	calcite 6.6
41	2	1	1	calcite	41	2	1	1	calcite	41	2	<u></u>	1	calcite
42	2	1	1	calcite	42	2	1	1	calcite	42	2	<u></u>	1	calcite
43	0	1	1	5.8	43	2	1	1	calcite	43	2	 1	1	calcite
44	1	1	1	5.2	44	2	1	1	calcite	44	1	1	1	2.5
45	2	1	1	calcite	45	0	1	0.7	8.6	45	2	1	1	calcite
46	2	1	1	calcite	46	2	1	1	calcite	46	2	1	1	calcite
47	2	1	1	calcite	47	2	1	1	calcite	47	1	11	1	12.2
48	2	1	1	calcite	48	2	1	1	calcite	48	2	1	1	calcite
49 50	0	1	0.8	3.8	49 50	2	1	1	calcite	49 50	2 2	<u> </u>	1 1	calcite
Cc, Cp, and	-		-	2.4	Cc, Cp, and	2	-		calcite	Cc, Cp, and				calcite
Cc, Cp, and Cp' =	1.74	1.00	1.00	-	Cc, Cp, and Cp' =	1.86	1.00	0.99	-	Cc, Cp, and Cp' =	1.70	1.00	0.98	-
	Calcite Index (CI) =		2.74			Calcite Index (CI) =		2.86			Calcite Index (CI) =		2.70	
Calcite	e Index Prime (CI') =		2.74		Calci	te Index Prime (CI') =		2.85		Calc	ite Index Prime (CI') =		2.68	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.6: Pebble Counts and Calcite Measurements at RG_GHFF on Upper Greenhills Creek, September 2022

		RG_GHFF-1					RG_GHFF-2					RG_GHFF-3		
		08-Sep-22					08-Sep-22					08-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)
1	2	1	1	5.0	1	2	1	1	4.5	1	2	1	1	9.0
2	2	1	1	4.5	2	2	1	1	7.0	2	2	1	1	8.5
3	2	1	1	10.5	3	2	1	1	Calcite	3	2	1	1	13.3
4	2	1	1	Calcite	4	2	1	1	6.2	4	0	1	1	4.5
5	2	1	0.5	7.2	5	2	1	1	6.5	5	0	1	0.8	6.0
6	0	1	0.2	1.9	6	2	1	1	Calcite	6	0	1	1	4.4
7	2	1	1	11.3	7	2	1	1	2.5	7	0	1	1	9.7
8 9	2	1	1	25.0	8	2	1	1	3.7	8	2	1	1	12.5
10	2 2	1	1	Calcite 11.5	9 10	0	1 1	0.8	7.5 8.5	9 10	1 1	1	0.9	5.8 6.3
11	2	1	1	6.6	11	2	1	0.9	2.5	11	1	1	0.9	5.8
12	2	1	1	3.3	12	2	1	1	2.0	12	2	1	1	9.3
13	2	1	1	9.7	13	2	1	1	11.5	13	0	1	0.9	6.5
14	2	1	1	4.8	14	2	1	1	10.0	14	2	1	1	15.7
15	2	1	1	12.8	15	1	1	0.7	4.2	15	0	1	0.8	5.3
16	2	1	1	12.5	16	0	1	0.8	9.5	16	2	1	1	8.0
17	2	1	1	Calcite	17	1	1	0.8	6.0	17	2	1	1	6.4
18	2	1	1	3.1	18	1	1	1	6.5	18	2	1	1	18.5
19	2	1	1	20.0	19	1	1	0.8	6.8	19	2	1	1	8.3
20	2	1	1	12.0	20	1	1	0.6	3.3	20	2	1	1	11.4
21	0	1	1	11.0	21	1	1 1	0.8	4.8	21	2	1	1	10.8
22	2 2	1	1	8.2 Calcite	22 23	2	· ·	0.8	5.5 5.0	22 23	0	1 1	0.6	14.3 4.8
23	2	1	1	11.2	24	1	1 1	0.8	5.5	23	0	1	1	3.5
25	2	1	1	13.0	25	2	1	1	1.4	25	0	1	1	4.0
26	2	1	1	13.6	26	1	1	0.8	4.2	26	1	1	1	6.0
27	2	1	1	11.8	27	0	1	1	8.0	27	2	1	1	10.0
28	2	1	1	Calcite	28	0	1	1	5.0	28	2	1	1	10.6
29	2	1	1	Calcite	29	1	1	0.9	4.5	29	2	1	1	7.8
30	2	1	1	9.3	30	1	1	0.8	3.5	30	2	1	1	11.5
31	1	1	1	0.8	31	2	1	1	8.0	31	2	1	1	Calcite
32	2	1	1	4.0	32	2	1	1	9.0	32	0	1	1	22.0
33	2	1	1	Calcite	33	2	1	1	5.0	33	2	1	1	29.5
34	2	1	1	3.8	34	2	1	1	7.5	34	1	1	1	5.4
35 36	2	1	0.9	Calcite 3.7	35 36	2 2	1 1	1	7.0 7.0	35 36	0 1	1	0.7	6.9 5.0
36	2	1	0.9	4.8	37	2	1	1	9.5	37	2	1	1	5.2
38	2	1	1	12.5	38	0	1	1	4.5	38	1	1	1	9.3
39	2	1	1	17.0	39	2	1	1	6.0	39	1	1	1	3.8
40	2	1	1	11.5	40	1	1	0.9	5.0	40	1	1	1	7.4
41	2	1	1	5.0	41	2	1	1	9.0	41	2	1	1	8.7
42	1	1	1	5.4	42	1	1	1	5.5	42	1	1	1	6.1
43	2	1	1	Calcite	43	0	1	1	10.0	43	0	1	1	5.8
44	2	1	1	Calcite	44	1	1	1	6.0	44	1	1	1	6.0
45	2	1	1	8.5	45	0	1	1	4.5	45	2	1	1	Calcite
46	1	1	1	7.7	46	1	1	1	5.0	46	0	1	1	7.3
47 48	2 2	1	1	7.0 14.5	47 48	1 1	1 1	0.8	8.5 6.5	47	2	1 1	1	5.6 3.5
48	2	1	1	6.5	48 49	1	1	1	5.0	48 49	0 2	1	1 1	7.1
50	2	1	1	9.0	50	1	1	0.8	7.5	50	1	1	0.6	7.1
Cc, Cp, and Cp' =	1.84	1.00	0.97	-	Cc, Cp, and Cp' =	1.32	1.00	0.94	-	Cc, Cp, and Cp' =		1.00	0.97	-
- 45	Calcite Index (CI) =		2.84		- 4-	Calcite Index (CI) =		2.32			Calcite Index (CI) =		2.18	
Calcit	e Index Prime (CI') =		2.81		Calci	te Index Prime (CI') =		2.26		Cala	ite Index Prime (CI') =		2.15	
Calcit	e muex Frime (Ci ) =		4.01		Calci	te muex Prime (Ci') =		4.40		Calc	ite iliuex Frime (Ci') =		4.10	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.6: Pebble Counts and Calcite Measurements at RG_GHFF on Upper Greenhills Creek, September 2022

		RG_GHFF-4					RG_GHFF-5					RG_GHFF-6		
		09-Sep-22					09-Sep-22					09-Sep-22		
Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence ^c	Intermediate Axis (cm)
1	2	1	1	Calcite	1	2	1	1	10.0	1	2	1	1	Calcite
2	2	1	1	4.0	2	2	1	1	8.5	2	1	1	1	1.1
3	2	1	1	3.6	3	2	1	1	12.6	3	2	1	1	6.0
4	2	1	1	Calcite	4	2	1	1	Calcite	4	2	1	1	10.0
5	0	1	0.6	8.5	5	0	1	1	6.3	5	2	1	1	5.3
6	2	1	1	8.7	6	1	1	1	4.0	6	2	1	1	7.5
7	2	1	1	6.5	7	1	1	1	6.2	7	2	1	1	7.5
<u>8</u> 9	2 2	1	1	10.0 6.5	<u>8</u> 9	2	1	0.9	Calcite 8.0	<u>8</u> 9	2 2	1	1	Calcite 2.5
10	2	1	1	7.0	10	2	1	0.9	8.5	10	2	1	1	2.2
11	2	1	1	7.7	11	2	1	1	Calcite	11	2	1	1	2.5
12	2	1	1	3.0	12	2	1	1	7.6	12	2	1	1	Calcite
13	2	1	1	5.0	13	1	1	0.6	3.7	13	2	1	1	9.0
14	1	1	1	3.9	14	2	1	1	9.8	14	2	1	1	6.0
15	0	1	0.8	2.9	15	2	1	1	14.3	15	2	1	1	Calcite
16	2	1	1	Calcite	16	1	1	0.8	5.5	16	2	1	1	12.0
17	2	1	1	2.5	17	1	1	1	5.7	17	2	1	1	Calcite
18	2	1	1	Calcite	18	2	1	1	3.5	18	2	1	1	Calcite
19	2	1	1	3.0	19	2	1	1	4.0	19	2	1	1	7.0
20	2	1	1	3.5	20	0	1	1	7.5 7.0	20	0	1	1	1.7
21 22	2 2	1	1	5.5 5.4	21 22	2	1	0.7	Calcite	21 22	0 2	1	1	1.2 2.5
23	2	1	1	4.5	23	2	1	1	Calcite	23	2	1	1	1.8
24	2	1	1	6.0	24	0	1	1	6.8	24	2	1	1	3.5
25	2	1	1	Calcite	25	2	1	1	Calcite	25	2	1	1	9.0
26	1	1	0.5	2.0	26	2	1	1	8.0	26	2	1	1	7.0
27	2	1	1	11.5	27	2	1	1	10.0	27	2	1	1	6.2
28	2	1	1	19.0	28	2	1	1	5.3	28	2	1	1	6.0
29	2	1	1	Calcite	29	2	1	1	9.0	29	2	1	1	20.0
30	2	1	1	19.5	30	2	1	1	7.5	30	2	1	1	19.0
31	2	1	1	14.7	31	2	1	1	6.0	31	2	1	1	12.0
32	1	1	1	5.3	32	2	1	1	9.5	32	2	1	1	5.5
33 34	1 2	1	0.9	2.2 6.0	33 34	0 2	1	0.9	2.5 5.0	33 34	2 2	1	1	1.8 17.0
35	2	1	0.5	2.9	35	1	1	1	9.5	35	2	1	1	8.5
36	0	1	0.9	3.5	36	2	1	1	5.7	36	2	1	1	11.0
37	0	1	0.9	12.0	37	2	1	1	Calcite	37	2	1	1	Calcite
38	2	1	1	2.0	38	1	1	1	5.5	38	2	1	1	11.0
39	2	1	1	6.0	39	2	1	1	4.0	39	2	1	1	10.0
40	1	1	1	4.0	40	0	1	1	2.4	40	2	1	1	16.5
41	2	1	1	14.0	41	2	1	1	3.0	41	2	1	1	13.0
42	2	1	1	5.0	42	0	1	1	2.8	42	2	1	1	5.0
43	1	1	0.8	4.0	43	2	1	1	4.3	43	2	1	1	4.2
44	2	1	1	5.0	44	2	1	1	5.5	44	2	1	1	5.3
45	2	1	1	10.5 5.2	45	2	1	1	6.0	45	2	1	1	11.0 2.2
46 47	1	1	0.7	14.2	46 47	2 2	1	1	Calcite 5.5	46 47	2 2	1	1 1	9.5
48	0	1	0.5	5.4	48	2	1	1	7.0	48	2	1	1	5.5
49	2	1	1	17.0	49	2	1	1	6.0	49	1	1	1	9.4
50	2	1	1	Calcite	50	2	1	1	4.0	50	2	1	1	11.5
Cc, Cp, and Cp' =	1.64	1.00	0.94	-	Cc, Cp, and Cp' =	1.56	1.00	0.98	-	Cc, Cp, and Cp' =		1.00	1.00	-
	Calcite Index (CI) =		2.64	·	•	Calcite Index (CI) =		2.56			Calcite Index (CI) =		2.88	•
Calcit	e Index Prime (CI') =		2.58		Calci	te Index Prime (CI') =		2.54		Calc	ite Index Prime (CI') =		2.88	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.7: Pebble Counts and Calcite Measurements at RG_GHBP on Lower Greenhills Creek, September 2022

		RG_GHBP-1					RG_GHBP-2					RG_GHBP-3		
		10-Sep-22					12-Sep-22					12-Sep-22		
Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a	Calcite Presence ^b	Proportional Calcite Presence c	Intermediate Axis (cm)
1	0	1	0.5	3.7	1	0	0	0	9.0	1	0	1	0.4	8.5
2	0	0	0	3.5	2	0	0	0	4.9	2	0	1	0.1	6.5
3	0	1	0.2	7.7	3	0	0	0	6.5	3	0	1	0.5	4.5
4	0	0	0	2.8	4	0	0	0	6.7	4	0	1	0.3	8.0
5	0	0	0	3.7	5	0	0	0	3.4	5	0	1	0.5	10.5
7	0	1	0.7 0.1	5.2 10.5	<u>6</u> 7	0	0	0	3.3 4.0	7	0	1	0.1 0.1	7.8 7.5
8	0	0	0.1	4.5		0	0	0	7.5	8	0	0	0.1	7.6
9	0	0	0	3.5	9	0	0	0	4.6	9	0	1	0.4	8.5
10	0	1	0.1	8.6	10	0	0	0	5.8	10	0	1	0.1	8.5
11	0	1	0.6	3.6	11	0	0	0	5.5	11	0	1	0.1	7.9
12	0	0	0	9.7	12	0	0	0	5.8	12	0	1	0.1	6.0
13	0	0	0	6.3	13	0	0	0	6.2	13	0	1	0.5	10.0
14	0	0	0	6.6	14	0	0	0	4.7	14	0	1	0.1	9.0
15	0	0	0	1.7	15	0	0	0	5.0	15	0	1	0.4	9.3
16	0	1	0.1	10.2	16	0	0	0	5.4	16	0	1	0.4	11.0
17 18	0	0	0 0.3	7.0 15.5	17 18	0	0	0	9.3 7.5	17 18	0	0	0.1	11.5 5.5
19	0	0	0.5	2.8	19	0	1	0.2	3.7	19	0	0	0	6.0
20	0	0	0	6.0	20	0	0	0	7.4	20	0	0	0	5.4
21	0	0	0	7.5	21	0	0	0	5.2	21	0	1	0.4	13.0
22	0	0	0	2.1	22	0	0	0	8.4	22	0	1	0.2	6.0
23	0	0	0	15.0	23	0	0	0	3.4	23	0	1	0.1	7.5
24	0	0	0	7.7	24	0	0	0	4.7	24	0	1	0.7	7.9
25	0	0	0	9.6	25	0	0	0	3.3	25	0	1	0.4	5.0
26	0	0	0	5.0	26	0	0	0	4.8	26	0	1	0.2	5.7
27	0	0	0	4.5	27	0	0	0	5.7	27	0	1	0.3	6.4
28 29	0	0	0	2.2	28 29	0	0	0	5.0 4.5	28 29	0	1	0.1	6.7
30	0	0	0	3.5 7.0	30	0	0	0	9.7	30	0	1	0.1 0.1	9.0 8.8
31	0	0	0	5.3	31	0	0	0	5.8	31	0	1	0.1	12.0
32	0	0	0	7.0	32	0	0	0	8.0	32	0	1	0.1	6.5
33	0	0	0	5.4	33	0	0	0	7.0	33	0	1	0.2	7.0
34	0	0	0	8.7	34	0	0	0	5.0	34	0	1	0.9	15.0
35	0	0	0	9.0	35	0	0	0	4.4	35	0	1	0.1	7.0
36	0	0	0	7.1	36	0	0	0	5.0	36	0	1	0.1	7.2
37	0	0	0	7.1	37	0	1	0.3	5.7	37	0	1	0.4	6.8
38	0	1	0.5	6.6	38	0	0	0	8.6	38	0	1	0.1	6.0
39 40	0	0	0	6.0 11.5	39 40	0	0	0	3.7 4.9	39 40	0	1	0.3 0.4	6.4 6.9
40	0	0	0	3.8	40	0	1	0.4	9.0	40	0	0	0.4	5.5
42	0	0	0	4.0	42	0	0	0.4	6.0	42	0	1	0.7	9.5
43	0	0	0	14.0	43	0	0	0	5.8	43	0	1	0.7	11.5
44	0	0	0	10.5	44	0	0	0	3.6	44	0	1	0.5	10.5
45	0	0	0	4.8	45	0	1	1	11.2	45	0	1	0.2	7.5
46	0	0	0	3.1	46	0	0	0	3.0	46	0	1	0.4	6.0
47	0	0	0	2.7	47	0	0	0	11.2	47	0	1	0.2	7.4
48	0	0	0	1.6	48	0	0	0	4.7	48	0	1	0.4	7.1
49	0	0	0	3.7	49	0	0	0	6.5	49	0	1	0.4	9.4
50 Cc, Cp, and	0	0	0	5.4	50 Cc, Cp, and	0	0	0	6.5	50 Cc, Cp, and	0	·	0.3	6.5
Cp' =	0.00	0.18	0.06	-	Cc, Cp, and Cp' =	0.00	0.08	0.04	-	Cc, Cp, and Cp' =	0.00	0.90	0.27	-
	Calcite Index (CI) =		0.18			Calcite Index (CI) =		0.08			Calcite Index (CI) =		0.90	
Calci	te Index Prime (CI') =		0.06		Calcit	e Index Prime (CI') =		0.04		Calcit	e Index Prime (CI') =		0.27	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.7: Pebble Counts and Calcite Measurements at RG_GHBP on Lower Greenhills Creek, September 2022

							RG_GHBP-5				RG_GHBP-6			
Ī		12-Sep-22					12-Sep-22					12-Sep-22		
Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)	Pebble	Concreted Status ^a		Proportional Calcite Presence c	Intermediate Axis (cm)
1	0	1	0.5	8.5	1	0	1	0.4	5.0	1	1	1	1	15.0
2	0	1	0.5	8.0	2	0	1	0.5	4.6	2	1	1	1	10.7
3	0	1	0.7	14.5	3	0	1	0.5	5.3	3	2	1	1	7.0
4	0	1	0.3	10.1	4	0	1	0.9	9.4	4	2	1	1	11.0
5	0	1	0.4	5.0	5	1	1	0.8	8.5	5	2	1	1	12.2
6	0	0	0	4.5 4.0	6	2	1	1	18.0	6 7	2	1	1	13.3
7 8	0	1	0.9 0.4	7.6	7 8	0	1	0.7	5.5 9.4	8	2 2	1	<u> </u>	12.5 8.2
9	0	1	0.6	7.7	9	0	1	0.6	7.8	9	0	1	0.5	1.8
10	0	1	0.3	5.7	10	0	1	0.4	9.5	10	2	1	1	calcite
11	0	1	0.6	11.3	11	0	1	0.4	1.5	11	0	1	0.7	3.3
12	0	1	0.9	5.4	12	0	1	0.9	4.5	12	2	1	1	6.5
13	0	1	0.7	6.5	13	0	1	0.8	0.5	13	0	0	0	4.2
14	0	1	0.2	6.3	14	0	1	0.8	7.5	14	1	1	0.8	6.2
15	0	1	0.6	7.7	15	1	1	0.7	14.2	15	2	1	1	8.8
16	0	1	0.6	5.6	16	0	1	0.9	9.0	16	0	1	1	13.2
17	0	1	0.2	4.2	17	0	1	0.95	19.5	17	0	1	0.8	8.0
18 19	0	1	0.3	9.0 5.3	18 19	2	1	1	14.3 8.9	18 19	0	1	0.6 0.5	12.1 6.3
20	0	1	0.8	5.0	20	2	1	1	7.8	20	1	1	0.5	18.5
21	0	1	1	5.0	21	0	1	0.4	7.7	21	2	1	1	7.2
22	0	1	1	4.0	22	0	1	0.7	4.6	22	0	1	0.9	14.5
23	0	1	0.7	2.4	23	0	1	1	11.3	23	2	1	1	6.0
24	0	1	0.8	9.4	24	0	1	0.9	9.5	24	0	1	0.4	8.9
25	0	1	1	11.2	25	1	1	0.9	10.0	25	0	1	0.7	6.4
26	0	1	1	6.3	26	0	1	1	11.8	26	0	1	1	7.5
27	0	1	1	7.3	27	0	1	1	8.5	27	2	1	1	7.5
28	0	1	1	7.5	28	0	1	0.7	10.4	28	0	1	1	8.7
29	1	1	1	calcite	29	2	1	1	5.5	29	2	1	1	12.0
30 31	0	1	1	7.4 12.2	30 31	2 2	1	1	9.0 10.3	30 31	0	1	1 0.9	10.3 19.0
32	0	1	1	11.7	32	0	1	1	8.5	32	2	1	0.9	10.5
33	0	1	1	5.9	33	0	1	0.8	7.5	33	0	1	0.9	6.7
34	1	1	1	4.4	34	2	1	1	5.0	34	2	1	1	7.0
35	0	1	1	11.9	35	0	1	0.7	5.4	35	1	1	1	18.0
36	0	1	1	11.0	36	0	1	1	4.3	36	2	1	1	11.5
37	0	1	0.9	5.7	37	2	1	1	5.3	37	0	1	1	7.4
38	0	1	0.9	6.8	38	2	1	1	9.5	38	0	1	1	6.8
39	0	1	1	7.1	39	0	1	1	8.0	39	0	1	0.3	2.8
40	0	1	1	4.7	40	0	1	- 1	4.7	40	0	1	1	3.7
41	0	1		5.0	41	0	1	'	8.3	41	2	1	•	11.2
42 43	0	1	0.9	4.6 8.9	42 43	0	1	0.2	4.0 11.5	42 43	0	0	0.8	1.6 0.9
44	0	1	0.7	6.0	44	0	1	0.9	9.5	44	0	1	1	9.2
45	1	1	0.8	11.0	45	0	1	0.4	8.5	45	0	0	0	2.8
46	0	1	1	6.0	46	0	1	0.8	7.7	46	2	1	1	17.0
47	0	1	1	7.8	47	1	1	0.5	9.2	47	0	1	0.6	6.2
48	0	1	0.9	7.2	48	2	1	0.5	7.0	48	0	1	0.4	3.4
49	0	1	0.8	5.0	49	0	1	0.8	10.5	49	1	1	0.9	5.0
50	0	1	1	8.5	50	0	1	0.8	7.2	50	1	1	0.9	6.5
Cc, Cp, and Cp' =	0.06	0.98	0.77	-	Cc, Cp, and Cp' =	0.48	1.00	0.79	-	Cc, Cp, and Cp' =	0.88	0.94	0.82	-
	Calcite Index (CI) =		1.04			Calcite Index (CI) =		1.48			Calcite Index (CI) =		1.82	
	e Index Prime (CI') =		0.83		Calcit	e Index Prime (CI') =		1.27		Calcit	e Index Prime (CI') =		1.70	

^a 0 = particle can be removed with no resistance; 1 = some resistance, but particle is still movable; 2 = particle is immovable/fully concreted.

^b 0 = calcite is absent; 1 = calcite is present.

^{° 0 =} calcite is absent; 0.5 = 50% of the rock surface is covered in calcite; 1 = the rock is fully covered in calcite. Proportional coverage is expressed in 10% increments.

Table F.8: Comparison of Calcite Presence and Concretion Scores Among Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas of Greenhills Creek, 2017 to 2022 a

	F	² -values		Calcit	e Presence/	Concretion	Score	Area Contrasts								Temporal Contrasts																			
Calcite	Year x		Year						Letter Contrasts						RG	_GHUT	RG	_GHNF	RG	_GHFF	RG_GHBP														
	Area	Year Area		RG_GHUT	RG_GHNF	RG_GHFF	RG_GHBP	RG_GHUT	RG_GHNF	RG_GHFF	RG_GHBP	RG_GHUT	RG_GHNF	RG_GHFF	Letter	MOD (%) ^c	Letter	MOD (%) ^c	Letter	MOD (%) ^c	Letter	MOD (%) ^c													
			2017	0.995	0.999	0.995	0.682	Α	А	Α	В	46	46	46	Α	-	Α	-	Α	-	В	-													
			2018	0.999	0.999	0.999	0.627	А	А	А	В	59	59	59	Α	0.34	Α	0	Α	0.34	ВС	-8.1													
Presence	~0 001 l	0.036 <0.001	2019	0.995	0.999	0.999	0.743	А	А	А	В	34	34	34	А	0.0011	Α	0	А	0.34	В	8.9													
Score (C _p ) ^d	<b>-0.001</b>	0.036 <0.001	2020	0.992	0.999	0.999	0.568	А	А	А	В	75	76	75.7	А	-0.33	Α	0	Α	0.34	С	-17													
			2021	0.999	0.999	0.995	0.890	А	А	А	А	12	12	12	Α	0.34	Α	0	Α	0.0022	Α	30													
			2022	0.999	0.999	0.999	0.661	А	А	А	В	51	51	51	Α	0.34	Α	0	Α	0.34	ВС	-3.1													
			2017	1.13	1.81	1.16	0.0796	А	А	А	В	1,316	2,170	1,361	С	-	AB	-	В	-	Α	-													
		:	2			_					-	-	_			2018	1.54	1.62	1.60	0.0755	А	А	А	В	1,943	2,051	2,018	AB	37	вс	-10	А	37	Α	-5.2
Concretion	<0.001					2019	1.78	1.97	1.59	0.0566	А	А	А	В	3,038	3,378	2,703	А	58	Α	9.0	Α	36	AB	-29										
Score (C _c )	40.001	40.001	2020	1.46	1.73	1.33	0.0487	А	А	Α	В	2,888	3,451	2,629	В	29	ABC	40	АВ	28	В	-39													
			2021	0.96	1.17	1.50	0.0082	А	А	А	В	11,536	14,066	18,061	С	-15	D	9	А	29	С	-90													
			2022	1.576	1.49	1.57	0.0487	А	А	А	В	3,135	2,949	3,113	AB	40	С	-18	А	35	В	-39													

Relevant p-value <0.05.

P-value <0.05 and MOD <0 (i.e., score is lower relative to the score for RG_GHBP or decreased relative to 2017).

P-value <0.05 and MOD >0 (i.e., score is higher relative to the score for RG_GHBP or increased relative to 2017).

Notes: MOD = Magnitude of Difference; % = percent; < = less than; - = no data/not applicable; > = greater than; GLMM = Generalized Linear Mixed Model; HSD = Honestly Significant Difference. Letters A, B, and C are used to illustrate similarities and differences among areas and years (e.g., areas assigned an "A" have significantly higher calcite presence scores than areas assigned a "B").

^a The differences among areas and years for calcite presence and concretion scores were compared using a GLMM with factors Area and Year assuming a negative binomial distribution. Post hoc comparisons were corrected for multiple comparisons using a Tukey's HSD test.

 $^{^{}b}$  MOD = (Score_{Exposed}-Score_{GHBP})/Score_{GHBP}.

^c MOD = (Score_{year}-Score₂₀₁₇)/Score₂₀₁₇.

d Binomial (i.e., "0" or "1") calcite presence scores (C_D) were included in the analysis, rather than proportional presence scores (C_D) because multiple years of data were available for the former (i.e., 2017 to 2022) but not the latter (i.e., 2021 and 2022 only).

Table F.9: Bulk Sediment Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks, September 2022

			BC W	SOG a			Gardine Creek						
	Constituent	Units	BC W	346		RG_GAUT							
	T		Upper	Lower	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5				
Physical Tests	Moisture	%	-	-	22.7	26.1	38.1	31.1	25.4				
Phy Te	pH (1:2)	рН	-	-	8.25	8.26	8.02	8.15	8.2				
	% Gravel (>2 mm)	%	-	-	5.5	10.2	1.9	4.1	5.5				
	% Sand (2.00 mm to 1.00 mm)	%	-	-	4.4	6.1	1.4	2.1	5.5				
ø.	% Sand (1.00 mm to 0.50 mm)	%	-	-	13.6	13.5	2.5	7.4	12.2				
Size	% Sand (0.50 mm to 0.25 mm)	%	-	-	14.9	13.8	3.0	11.5	10.2				
Particle	% Sand (0.25 mm to 0.125 mm)	%	-	-	11.9	9.4	4.8	8.9	6.0				
Par	% Sand (0.125 mm to 0.063 mm)	%	-	-	7.8	6.9	7.6	8.9	8.2				
	% Silt (0.063 mm to 0.0312 mm) % Silt (0.0312 mm to 0.004 mm)	%	-	-	13.0 21.1	12.8 20.6	26.3 42.3	18.7 29.4	17.2 27.1				
	% Clay (<4 µm)	%	-	-	7.8	6.7	10.2	9.0	8.1				
Organic Carbon	Total Organic Carbon	%	-	-	11.2	9.36	22.0	13.3	14.4				
	Aluminum (Al)	mg/kg	-	-	9,440	8,130	6,860	9,840	10,600				
	Antimony (Sb)	mg/kg	-	-	0.90	0.89	0.86	0.97	0.88				
	Arsenic (As)	mg/kg	5.90	17.0	6.89	6.99	5.22	6.81	6.46				
	Barium (Ba)	mg/kg	-	-	318	312	306	347	370				
	Beryllium (Be)	mg/kg	-	-	0.83	0.78	0.73	0.81	0.81				
	Bismuth (Bi) Boron (B)	mg/kg mg/kg	-	-	<0.20 7.6	<0.20 5.4	<0.20 5.4	<0.20 8.2	<0.20 9.5				
	Cadmium (Cd)	mg/kg	0.600	3.50	0.809	0.918	0.978	0.958	0.891				
	Calcium (Ca)	mg/kg	-	-	11,800	12,000	13,400	12,700	12,200				
	Chromium (Cr)	mg/kg	37.3	90.0	13.3	11.6	11.1	14.6	14.9				
	Cobalt (Co)	mg/kg	-	-	11.5	11.1	7.57	10.7	10.3				
	Copper (Cu)	mg/kg	35.7	197	19.8	20.0	21.6	21.0	20.4				
	Iron (Fe)	mg/kg	21,200	43,766	20,400	19,500	12,700	18,800	18,700				
	Lead (Pb)	mg/kg	35.0	91.3	14	13.6	11.6	13.4	12.7				
	Lithium (Li)	mg/kg	-	-	13.5	12.4	8.9	12.3	13.1				
	Magnesium (Mg)	mg/kg	-	-	4,410	3,920	3,420	4,090	4,100				
als	Manganese (Mn)	mg/kg	460	1,100	548	622	357	508	486				
Metals	Mercury (Hg) Molybdenum (Mo)	mg/kg mg/kg	0.170 25.0	0.486 23,000	0.0623 1.40	0.0668 1.42	0.0898 1.27	0.0737 1.45	0.0748 1.34				
	Nickel (Ni)	mg/kg	16.0	75.0	33.8	33.1	25.8	33.3	31.2				
	Phosphorus (P)	mg/kg	-	-	1,340	1,300	1,020	1,270	1,300				
	Potassium (K)	mg/kg	-	-	1,850	1,500	1,380	2,060	2,270				
	Selenium (Se)	mg/kg	2	b	1.18	1.22	1.57	1.49	1.32				
	Silver (Ag)	mg/kg	0.500	-	0.25	0.27	0.37	0.30	0.27				
	Sodium (Na)	mg/kg	-	-	63	56	54	66	70				
	Strontium (Sr)	mg/kg	-	-	51	47.8	50.7	52.4	50.6				
	Sulfur (S) Thallium (TI)	mg/kg mg/kg	-	-	<1,000 0.178	<1,000 0.14	<1,000 0.135	<1,000 0.167	<1,000 0.169				
	Tin (Sn)	mg/kg		-	<2.0	<2.0	<2.0	<2.0	<2.0				
	Titanium (Ti)	mg/kg	-	-	17.1	10.1	13.0	18.3	17.6				
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50				
	Uranium (U)	mg/kg	-	-	0.825	0.845	1.00	0.941	0.881				
	Vanadium (V)	mg/kg	-	-	29.4	26.5	24.4	33.6	34.0				
	Zinc (Zn)	mg/kg	123	315	114	113	90.7	124	110				
	Zirconium (Zr)	mg/kg	- 0.000=:	- 0.0000	1.3	1.2	1.4	1.1	1.0				
	Acenaphthene Acenaphthylene	mg/kg	0.00671 0.00587	0.0889	0.092 <0.050	0.167 <0.050	0.384 0.056	0.204 <0.050	0.138 <0.050				
	Acridine	mg/kg mg/kg	-	J. 120 -	0.140	0.282	0.056	0.320	0.218				
	Anthracene	mg/kg	0.0469	0.245	<0.050	<0.050	<0.050	<0.050	<0.050				
	Benz(a)anthracene	mg/kg	0.0317	0.385	<0.050	0.090	0.206	0.108	0.070				
us	Benzo(a)pyrene	mg/kg	0.0319	0.782	<0.050	0.060	0.123	0.064	<0.050				
olycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene	mg/kg	-	-	0.130	0.248	0.507	0.268	0.184				
7008	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.130	0.248	0.567	0.268	0.184				
H ydi	Benzo(g,h,i)perylene	mg/kg	0.170	3.20	0.056	0.094	0.187	0.097	0.065				
tic	Benzo(k)fluoranthene	mg/kg	0.240	13.4	<0.050	<0.050	0.060 1.13	<0.050	<0.050				
oma	Chrysene Dibenz(a,h)anthracene	mg/kg mg/kg	0.0571	0.862 0.135	0.303 <0.050	0.537 <0.050	0.091	0.579 <0.050	0.43 <0.050				
Ä	Fluoranthene	mg/kg	0.00022	2.36	<0.050	0.030	0.091	0.030	0.057				
/clic	Fluorene	mg/kg	0.0212	0.144	0.214	0.395	0.947	0.476	0.32				
<del>,</del>	Indeno(1,2,3-c,d)pyrene	mg/kg	0.200	3.20	<0.050	<0.050	0.059	<0.050	<0.050				
Pol	1-Methylnaphthalene	mg/kg	-	-	1.32	2.38	5.49	2.80	1.94				
	2-Methylnaphthalene	mg/kg	0.0202	0.201	2.55	4.65	10.8	5.52	3.81				
	Naphthalene	mg/kg	0.0346	0.391	0.858	1.57	3.74	1.84	1.28				
			0.0419	0.515	0.982	1.79	4.09	2.15	1.47				
	Phenanthrene	mg/kg											
	Phenanthrene Pyrene Quinoline	mg/kg mg/kg mg/kg	0.0530	0.875	0.105 <0.050	0.180 <0.050	0.386 <0.050	0.210 <0.050	0.148 <0.050				

Concentration is <LRL and LRL exceeds the lower WSQG.
Concentration is <LRL and LRL exceeds the upper WSQG.
Concentration exceeds the lower WSQG.
Concentration exceeds the upper WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; % = percent; - = no data/not applicable; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.9: Bulk Sediment Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks, September 2022

	Constituent		BC VV	SQG ^a					
		Units	Lower	Upper	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5
la "	Moisture	%	Lower	Upper -	42.6	46.9	39.0	48.5	49.8
Physical Tests									
₫'	pH (1:2)	рН	-	-	8.15	8.20	8.16	8.24	8.16
ļ	% Gravel (>2 mm)	%	-	-	<1.0	<1.0	4.9	<1.0	1.1
ļ	% Sand (2.00 mm to 1.00 mm)	%	-	-	1.6	2.2	11.9	1	5.4
Size	% Sand (1.00 mm to 0.50 mm) % Sand (0.50 mm to 0.25 mm)	%	-	-	5.6 9.1	3.8 11.5	9.3	2.3 3.1	9.4
<u>9</u>	% Sand (0.25 mm to 0.125 mm)	%	<u>-</u>	_	12	17.3	11.2	6.6	11.4
Particle	% Sand (0.125 mm to 0.063 mm)	%	-	-	7.5	10.7	6.2	4.8	5.9
ď	% Silt (0.063 mm to 0.0312 mm)	%	-	-	12.5	14.3	9	11.4	11.9
ļ	% Silt (0.0312 mm to 0.004 mm)	%	-	-	32	27.3	22.6	42.2	28.6
	% Clay (<4 μm)	%	-	-	19.7	12.4	14.3	28.2	16
Organic Carbon	Total Organic Carbon	%	-	-	16.5	13.3	11.5	23.8	17.8
	Aluminum (AI)	mg/kg	-	-	8,260	8,980	6,830	5,980	6,680
	Antimony (Sb)	mg/kg	-	-	0.75	0.58	0.63	0.68	0.67
	Arsenic (As)	mg/kg	5.90	17.0	5.56	5.28	4.55	4.24	5.46
	Barium (Ba) Beryllium (Be)	mg/kg	-	-	225 0.70	229 0.74	212 0.59	216 0.59	206 0.66
	Bismuth (Bi)	mg/kg mg/kg	<u>-</u>	-	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)	mg/kg	-	-	8.7	9.0	6.0	<5.0	<5.0
	Cadmium (Cd)	mg/kg	0.600	3.50	0.727	0.689	0.681	0.711	0.714
ļ	Calcium (Ca)	mg/kg	-	-	59,300	58,600	82,100	83,100	65,600
ļ	Chromium (Cr)	mg/kg	37.3	90.0	11.9	12.4	9.78	8.86	9.80
ļ	Cobalt (Co)	mg/kg	-	-	7.31	7.68	7.02	6.79	8.27
ļ	Copper (Cu)	mg/kg	35.7	197	15.7	14.7	14.4	14.9	16.0
ļ	Iron (Fe) Lead (Pb)	mg/kg	21,200 35.0	43,766 91.3	14,500 10.7	16,300 10.7	12,700 9.64	10,800 9.43	15,600 11.1
ļ	Lithium (Li)	mg/kg mg/kg	-	-	11.6	12.6	10.5	9.43	11.3
ļ	Magnesium (Mg)	mg/kg		_	3,620	3,750	3,830	3,580	3,930
S	Manganese (Mn)	mg/kg	460	1,100	380	478	402	346	516
Metals	Mercury (Hg)	mg/kg	0.170	0.486	0.0509	0.0391	0.0448	0.0610	0.0532
Σ	Molybdenum (Mo)	mg/kg	25.0	23,000	1.24	1.09	1.09	1.18	1.23
ļ	Nickel (Ni)	mg/kg	16.0	75.0	25.4	24.7	23.1	21.9	25.8
ļ	Phosphorus (P)	mg/kg	-	-	976	1,010	846	831	1,000
ļ	Potassium (K) Selenium (Se)	mg/kg mg/kg	- 2	- b	2,030 1.54	2,090 1.21	1,590 1.21	1,390 1.31	1,360 1.19
ļ	Silver (Ag)	mg/kg	0.500	_	0.30	0.21	0.24	0.25	0.22
ļ	Sodium (Na)	mg/kg	-	-	69	74	70	66	67
ļ	Strontium (Sr)	mg/kg	-	-	64.0	64.9	70.1	72.0	62.9
ļ	Sulfur (S)	mg/kg	-	-	1,100	1,100	1,500	1,600	1,200
ļ	Thallium (TI)	mg/kg	-	-	0.154	0.159	0.131	0.112	0.124
ļ	Tin (Sn)	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti) Tungsten (W)	mg/kg mg/kg	-	-	15.0 <0.50	14.2 <0.50	11.6 <0.50	10.8 <0.50	11.8 <0.50
	Uranium (U)	mg/kg	-	-	0.815	0.763	0.747	0.751	0.792
	Vanadium (V)	mg/kg	-	-	27.5	28.2	22.5	21.2	22.3
	Zinc (Zn)	mg/kg	123	315	90.7	88.5	79.2	78.0	91.8
	Zirconium (Zr)	mg/kg	-	-	<1.0	<1.0	1.2	<1.0	1.0
	Acenaphthene	mg/kg	0.00671	0.0889	0.256	0.138	0.239	0.580	0.508
	Acenaphthylene	mg/kg	0.00587	0.128	<0.050	<0.050	<0.050	0.095	0.084
	Acridine Anthracene	mg/kg mg/kg	0.0469	0.245	0.429 <0.050	0.207 <0.050	0.346	0.905 <0.050	0.829 <0.050
	Benz(a)anthracene	mg/kg	0.0469	0.245	0.133	0.050	0.129	0.316	0.299
SL	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.092	<0.050	0.064	0.178	0.163
rboı	Benzo(b&j)fluoranthene	mg/kg	-	-	0.301	0.118	0.223	0.568	0.541
oca.	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.366	0.118	0.313	0.682	0.762
olycyclic Aromatic Hydrocarbons	Benzo(g,h,i)perylene	mg/kg	0.170	3.20	0.060	<0.050	0.066	0.196	0.213
tic F	Benzo(k)fluoranthene	mg/kg	0.240	13.4	0.065	<0.050	0.090	0.114	0.221
oma	Chrysene Dibenz(a,h)anthracene	mg/kg	0.0571 0.00622	0.862 0.135	0.715 0.056	0.314 <0.050	0.552 <0.050	1.40 0.111	1.29 0.103
; Arc	Fluoranthene	mg/kg mg/kg	0.00622	2.36	0.056	0.050	0.099	0.111	0.103
/clic	Fluorene	mg/kg	0.0212	0.144	0.615	0.338	0.568	1.40	1.25
lyc	Indeno(1,2,3-c,d)pyrene	mg/kg	0.200	3.20	<0.050	<0.050	<0.050	0.074	0.071
Ро	1-Methylnaphthalene	mg/kg	-	-	3.48	2.13	3.29	7.80	6.97
	2-Methylnaphthalene	mg/kg	0.0202	0.201	6.34	3.80	6.14	14.5	13.0
	Naphthalene	mg/kg	0.0346	0.391	2.26	1.50	2.26	5.15	4.66
	Phenanthrene	mg/kg	0.0419	0.515	2.45	1.32	2.24	5.36	4.94
	Pyrene	mg/kg mg/kg	0.0530	0.875	0.231 <0.050	0.114 <0.050	0.200 <0.050	0.472 <0.050	0.431 <0.050

Concentration is <LRL and LRL exceeds the lower WSQG.
Concentration is <LRL and LRL exceeds the upper WSQG.
Concentration exceeds the lower WSQG.
Concentration exceeds the upper WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; % = percent; - = no data/not applicable; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.9: Bulk Sediment Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks, September 2022

			BC W	SQG ^a		Gr	eenhills Creek S	edimentation Po	nd	
	Constituent	Units	B0 11			T		GHP	T	
	1		Lower	Upper	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Physical Tests	Moisture	%	-	-	73.0	69.0	60.5	65.5	61.2	65.8
Phy T	pH (1:2)	рН	-	-	7.80	8.09	7.94	8.04	7.85	7.95
	% Gravel (>2 mm)	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	% Sand (2.00 mm to 1.00 mm)	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Size	% Sand (1.00 mm to 0.50 mm)	%	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
e Si	% Sand (0.50 mm to 0.25 mm)	%	-	-	<1.0	4.0	<1.0	<1.0	<1.0	<1.0
Particle	% Sand (0.25 mm to 0.125 mm) % Sand (0.125 mm to 0.063 mm)	%	-	-	<1.0 6.8	8.9 9.9	<1.0 1.2	2.1 4.8	<1.0 <1.0	<1.0 1.5
Ра	% Silt (0.063 mm to 0.0312 mm)	%	_	_	23.4	15.7	13.0	17.9	13.8	20.5
	% Silt (0.0312 mm to 0.004 mm)	%	-	-	48.5	40.9	50.9	45.6	50.2	47.9
	% Clay (<4 μm)	%	-	-	20.2	19.6	34.6	29.2	34.7	28.8
Organic Carbon	Total Organic Carbon	%	1	-	17.5	18.8	17.8	25.1	18.7	26.1
	Aluminum (Al)	mg/kg	-	-	7,280	5120	8,320	7,180	8,840	7,720
	Antimony (Sb)	mg/kg	-	-	1.23	1.11	1.25	1.02	1.21	1.11
	Arsenic (As) Barium (Ba)	mg/kg	5.90	17.0	4.94	3.37 259	6.30	5.28 294	6.71 346	5.77 285
	Beryllium (Be)	mg/kg mg/kg	-	-	0.63	0.46	0.83	0.70	0.86	0.81
	Bismuth (Bi)	mg/kg	-	-	<0.20	<0.20	0.83	<0.20	0.80	<0.20
	Boron (B)	mg/kg	-	-	5.7	<5.0	5.9	5.6	<5.0	<5.0
	Cadmium (Cd)	mg/kg	0.600	3.50	1.46	1.32	1.40	1.16	1.52	1.30
	Calcium (Ca)	mg/kg	-	-	104,000	180,000	48,300	55,700	60,300	72,000
	Chromium (Cr)	mg/kg	37.3	90.0	11.4	8.18	13.5	10.9	13.7	12.0
	Cobalt (Co)	mg/kg	-	- 407	8.92	6.85	11.3	8.58	12.2	9.74
	Copper (Cu) Iron (Fe)	mg/kg	35.7 21,200	197 43,766	22.2 11,500	7,860	26.7 14,500	23.5 11,400	29.9 14,600	25.0 11,800
	Lead (Pb)	mg/kg mg/kg	35.0	91.3	10.7	8.13	13.7	11.6	14,000	12.3
	Lithium (Li)	mg/kg	-	-	7.2	5.3	8.9	7.8	8.3	7.8
	Magnesium (Mg)	mg/kg	-	-	5,900	5,620	4,920	4,440	4,880	4,500
<u>8</u>	Manganese (Mn)	mg/kg	460	1,100	216	176	530	215	671	585
Metals	Mercury (Hg)	mg/kg	0.170	0.486	0.0822	0.0628	0.117	0.0933	0.111	0.0930
_	Molybdenum (Mo)	mg/kg	25.0	23,000	1.54	1.15	1.68	1.36	1.83	1.59
	Nickel (Ni)	mg/kg	16.0	75.0	64.5	64.4	66.6	59.0	70.6	67.4
	Phosphorus (P) Potassium (K)	mg/kg mg/kg	-	-	847 1,730	697 1,260	1,040 1,910	964 1,730	1,040 2,140	874 1,880
	Selenium (Se)	mg/kg		b	80.9	76.2	16.8	28.6	14.2	9.02
	Silver (Ag)	mg/kg	0.500	-	0.35	0.26	0.45	0.39	0.44	0.40
	Sodium (Na)	mg/kg	-	-	81	95	66	65	70	69
	Strontium (Sr)	mg/kg	-	-	83.7	152	59.0	58.8	65.7	67.7
	Sulfur (S)	mg/kg	-	-	6,600	3,400	1,200	1,800	1,200	1,400
	Thallium (TI) Tin (Sn)	mg/kg	-	-	0.181 <2.0	0.113 <2.0	0.146 <2.0	0.102 <2.0	0.118 <2.0	0.096 <2.0
	Titanium (Ti)	mg/kg mg/kg	-	-	9.0	7.4	10.5	8.6	5.9	6.7
	Tungsten (W)	mg/kg	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	2.87	4.16	1.24	1.42	1.25	1.08
	Vanadium (V)	mg/kg	-	-	26.6	19.5	31.5	28.0	34.4	29.9
	Zinc (Zn)	mg/kg	123	315	128	106	138	117	148	128
	Zirconium (Zr)	mg/kg	- 0.00671	- 0.0000	1.8	1.1	<1.0	1.0	<1.0	<1.0
	Acenaphthene Acenaphthylene	mg/kg mg/kg	0.00671 0.00587	0.0889 0.128	0.540 0.078	0.430 0.058	0.435 0.066	0.738 0.101	0.469 0.068	0.751 0.111
	Acridine	mg/kg	-	-	0.078	0.058	0.802	1.37	0.000	1.46
	Anthracene	mg/kg	0.0469	0.245	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benz(a)anthracene	mg/kg	0.0317	0.385	0.354	0.245	0.260	0.398	0.276	0.416
Suc	Benzo(a)pyrene	mg/kg	0.0319	0.782	0.232	0.172	0.173	0.263	0.182	0.29
arbo	Benzo(b&j)fluoranthene	mg/kg	-	-	0.857	0.664	0.733	0.979	0.715	0.997
olycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene Benzo(g,h,i)perylene	mg/kg mg/kg	- 0.170	3.20	0.939 0.257	0.736 0.203	0.833 0.217	1.09 0.289	0.795 0.208	1.09 0.324
H X	Benzo(k)fluoranthene	mg/kg	0.170	13.4	0.257	0.203	0.217	0.269	0.208	0.324
atic	Chrysene	mg/kg	0.0571	0.862	1.85	1.30	1.47	2.04	1.49	2.21
rom	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	0.157	0.119	0.122	0.173	0.122	0.188
ic A	Fluoranthene	mg/kg	0.111	2.36	0.298	0.197	0.220	0.306	0.229	0.311
cycl	Fluorene	mg/kg	0.0212	0.144	1.36	1.12	1.10	2.01	1.26	2.08
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.200	3.20	0.130	0.098	0.093	0.133	0.096	0.137
Δ.	1-Methylnaphthalene 2-Methylnaphthalene	mg/kg	0.0202	0.201	7.02 12.5	5.49 10.0	5.48 9.54	9.71 18.0	5.86 10.1	10.0 18.2
	Naphthalene	mg/kg mg/kg	0.0202	0.201	4.09	3.33	2.98	6.31	3.16	6.28
	Phenanthrene	mg/kg	0.0419	0.515	5.25	4.11	4.40	6.90	4.68	7.25
	Pyrene	mg/kg	0.0530	0.875	0.540	0.434	0.489	0.680	0.481	0.684
	'				0.0.0	00.		0.000	00.	

Concentration is <LRL and LRL exceeds the lower WSQG.
Concentration is <LRL and LRL exceeds the upper WSQG.
Concentration exceeds the lower WSQG.

Concentration exceeds the lower WSQG.

Concentration exceeds the upper WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; % = percent; - = no data/not applicable; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.9: Bulk Sediment Quality at Biological Monitoring Areas on Greenhills and Gardine Creeks, September 2022

			BC W	SOG a		Lov	wer Greenhills Cr	eek	
	Constituent	Units	BC W	346			RG_GHBP		
	T		Lower	Upper	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5
Physical Tests	Moisture	%	-	-	40.5	57.6	44.1	53.3	60.8
Phy Te	pH (1:2)	рН	-	-	8.40	8.26	8.31	8.21	8.34
	% Gravel (>2 mm)	%	-	-	<1.0	<1.0	<1.0	2.1	5.0
	% Sand (2.00 mm to 1.00 mm)	%	-	-	2.0	2.4	<1.0	7.1	12.8
ø.	% Sand (1.00 mm to 0.50 mm)	%	-	-	11.2	8.3	<1.0	5.9	17.0
Size	% Sand (0.50 mm to 0.25 mm)	%	-	-	21.3	15.0	1.8	7.4	13.3
Particle	% Sand (0.25 mm to 0.125 mm)	%	-	-	13.4	9.9	5.6	12.3	9.6
Par	% Sand (0.125 mm to 0.063 mm)	%	-	-	5.3	4.3	5.4	6.3	4.6
	% Silt (0.063 mm to 0.0312 mm) % Silt (0.0312 mm to 0.004 mm)	%	-	-	10.5 21.4	10.6 25.5	18.6 37.9	14.7 27.1	6.8 15.9
	% Clay (<4 µm)	%	-	-	14.9	24.0	30.5	17.1	15.0
Organic Carbon	Total Organic Carbon	%	-	-	8.79	12.3	16.4	10.4	8.96
	Aluminum (Al)	mg/kg	-	-	9,390	6,480	7,440	6,190	4,100
	Antimony (Sb)	mg/kg	-	-	0.83	0.83	0.78	0.62	0.33
	Arsenic (As)	mg/kg	5.90	17.0	6.95	6.26	7.36	4.45	2.86
	Barium (Ba)	mg/kg	-	-	196	173	223	232	136
	Beryllium (Be)	mg/kg	-	-	0.79	0.68	0.68	0.58	0.36
	Bismuth (Bi)	mg/kg	-	-	<0.20 10	<0.20	<0.20 5.8	<0.20	<0.20
	Boron (B) Cadmium (Cd)	mg/kg mg/kg	0.600	3.50	1.01	5.8 1.20	1.40	6.3 1.23	6.2 1.10
	Calcium (Ca)	mg/kg	-	-	41,500	50,400	62,700	71,300	107,000
	Chromium (Cr)	mg/kg	37.3	90.0	14.1	10.8	12.4	9.85	6.25
	Cobalt (Co)	mg/kg	-	-	8.55	7.62	9.61	7.51	5.08
	Copper (Cu)	mg/kg	35.7	197	17.0	16.7	19.0	16.0	10.1
	Iron (Fe)	mg/kg	21,200	43,766	20,400	17,900	21,800	12,900	9,010
	Lead (Pb)	mg/kg	35.0	91.3	13.2	12.6	11.7	10.3	6.32
	Lithium (Li)	mg/kg	-	-	13.9	11.7	12.0	9.2	6.4
	Magnesium (Mg)	mg/kg	-	-	6,020	5,310	6,010	5,530	5,010
als	Manganese (Mn)	mg/kg	460	1,100	520	433	701	435	281
Metals	Mercury (Hg) Molybdenum (Mo)	mg/kg	0.170 25.0	0.486 23,000	0.0408 1.66	0.0491 1.84	0.0422 1.52	0.0545 1.22	0.0305 0.72
	Nickel (Ni)	mg/kg mg/kg	16.0	75.0	63.5	51.6	68.9	65.3	46.3
	Phosphorus (P)	mg/kg	-	-	1,290	1,240	1,190	1,080	725
	Potassium (K)	mg/kg	-	-	2,050	1,300	1,990	1,390	1,020
	Selenium (Se)	mg/kg	2	b	6.85	5.54	6.14	8.40	7.66
	Silver (Ag)	mg/kg	0.500	-	0.20	0.24	0.20	0.24	0.13
	Sodium (Na)	mg/kg	-	-	76	59	104	72	69
	Strontium (Sr)	mg/kg	-	-	49.4	50.4	55.6	58.7	60.8
	Sulfur (S)	mg/kg	-	-	<1,000	<1,000	<1,000	1,400	1,700
	Thallium (TI)	mg/kg	-	-	0.237 <2.0	0.192 <2.0	0.192	0.180	0.107
	Tin (Sn) Titanium (Ti)	mg/kg mg/kg	-	-	15.8	10.3	<2.0 11.4	<2.0 9.8	<2.0 9.1
	Tungsten (W)	mg/kg	<u>-</u>	_	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U)	mg/kg	-	-	1.04	1.13	1.06	1.36	0.959
	Vanadium (V)	mg/kg	-	-	30.4	23.0	26.2	21.8	14.0
	Zinc (Zn)	mg/kg	123	315	132	136	149	124	103
	Zirconium (Zr)	mg/kg	-	-	1.2	1.1	1.0	1.1	<1.0
	Acenaphthene	mg/kg	0.00671	0.0889	0.067	0.133	0.178	0.088	0.175
	Acenaphthylene	mg/kg	0.00587	0.128	<0.050	<0.050	<0.050	<0.050	<0.050
	Acridine	mg/kg	- 0.0400	- 0.045	0.094	0.270	0.356	0.176	0.360
	Anthracene Benz(a)anthracene	mg/kg mg/kg	0.0469	0.245 0.385	<0.050 <0.050	<0.050 0.085	<0.050 0.102	<0.050 0.056	<0.050 0.105
တ္	Benzo(a)pyrene	mg/kg	0.0317	0.385	<0.050	<0.050	0.102	<0.050	0.105
noq	Benzo(b&j)fluoranthene	mg/kg	-	-	0.076	0.191	0.218	0.115	0.231
olycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene	mg/kg	-	-	0.076	0.191	0.218	0.115	0.231
ydro	Benzo(g,h,i)perylene	mg/kg	0.170	3.20	<0.050	0.076	0.090	0.054	0.096
ic H	Benzo(k)fluoranthene	mg/kg	0.240	13.4	<0.050	<0.050	<0.050	<0.050	<0.050
mat	Chrysene	mg/kg	0.0571	0.862	0.208	0.442	0.530	0.286	0.488
Aro	Dibenz(a,h)anthracene	mg/kg	0.00622	0.135	<0.050	<0.050	<0.050	<0.050	0.050
S	Fluoranthene	mg/kg	0.111	2.36	<0.050 0.144	0.081	0.094	0.051	0.103
ycy	Fluorene Indeno(1,2,3-c,d)pyrene	mg/kg mg/kg	0.0212	0.144 3.20	<0.050	0.319 <0.050	0.430 <0.050	0.213 <0.050	0.438 <0.050
Pol)	1-Methylnaphthalene	mg/kg	-	-	0.847	1.59	2.14	1.09	2.19
	2-Methylnaphthalene	mg/kg	0.0202	0.201	1.45	2.77	3.80	1.84	3.94
	Naphthalene	mg/kg	0.0346	0.391	0.426	0.755	1.07	0.509	1.16
	<u> </u>		0.0419	0.515	0.650	1.73	2.17	1.22	2.03
	Phenanthrene	mg/kg	0.0419	0.515	0.000				
	Phenanthrene Pyrene	mg/kg mg/kg	0.0419	0.875	0.0640	0.134	0.161	0.088	0.159

Concentration is <LRL and LRL exceeds the lower WSQG.
Concentration is <LRL and LRL exceeds the upper WSQG.
Concentration exceeds the lower WSQG.
Concentration exceeds the upper WSQG.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; % = percent; - = no data/not applicable; > = greater than; mm = millimetres; < = less than; µm = micrometres; mg/kg = milligrams per kilogram; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.10: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GAUT-1 on Gardine Creek, September 2022

		BC W	SQG ^a	l			SEA	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	595	1,850	8,080	<2,545	<10,625	<645	9,440
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.700	<0.4	<1.1	<0.2	0.900
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	0.0540	0.516	0.408	<5	<1.03	<6.03	0.570	6.89
Barium (Ba)	mg/kg	-	-	44.2	35.7	51.3	25.3	120	156	276	87.0	318
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.300	<0.2	0.380	<0.9	<1.28	<0.5	0.830
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	7.60
Cadmium (Cd)	mg/kg	0.600	3.50	0.152	0.166	0.385	0.0800	0.0740	0.783	0.857	0.551	0.809
Calcium (Ca)	mg/kg	-	-	3,750	2,760	3,020	1,040	678	10,570	11,248	5,780	11,800
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.800	3.66	11.4	<9.96	<21.4	<5.8	13.3
Cobalt (Co)	mg/kg	-	-	0.170	0.700	4.46	1.10	2.85	6.43	9.28	5.16	11.5
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.690	6.38	12.3	<8.07	<20.4	<1.19	19.8
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,810	1,890	11,600	<5,800	<17,400	<3,860	20,400
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.26	0.800	7.04	<5.06	<12.1	<3.76	14.0
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	7.00	<20	<27	<10	13.5
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	4,410
Manganese (Mn)	mg/kg	460	1,100	36.1	101	218	19.9	43.4	375	418	319	548
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0623
Molybdenum (Mo)	mg/kg	25.0	23,000	< 0.5	<0.5	<0.5	<0.5	0.960	<2	<2.96	<1	1.40
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	11.3	6.08	11.4	<19.9	<31.3	<13.3	33.8
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	183	-	-	<283	<283	<233	1,340
Potassium (K)	mg/kg	-	-	140	-	-	-	-	140	140	-	1,850
Selenium (Se) b	mg/kg	2.	00	<0.2	<0.2	<0.2	0.900	0.460	<1.5	<1.96	<0.4	1.18
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.100	<0.1	0.120	<0.4	<0.52	<0.2	0.250
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	63.0
Strontium (Sr)	mg/kg	-	-	12.9	5.40	6.18	4.75	19.1	29.2	48.3	11.6	51.0
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	< 0.05	<0.05	<0.05	< 0.05	0.137	<0.2	< 0.337	<0.1	0.178
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	1.70	16.8	<8.7	<25.5	<6	17.1
Tungsten (W)	mg/kg		-	-	-	-	-	-	-	-	-	<0.5
Uranium (U)	mg/kg	-	-	< 0.05	<0.05	0.161	0.255	0.346	<0.516	<0.862	<0.211	0.825
Vanadium (V)	mg/kg		-	<0.2	<0.2	2.78	4.26	28.9	<7.44	<36.3	<2.98	29.4
Zinc (Zn)	mg/kg	123	315	<1	5.00	26.5	8.90	62.7	<41.4	<104	31.5	114

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.11: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GAUT-2 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA F	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	609	1,740	7,710	<2,449	<10,159	<659	8,130
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.760	<0.4	<1.16	<0.2	0.890
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.0580	0.556	0.495	<5	<1.16	<6.16	0.614	6.99
Barium (Ba)	mg/kg	-	-	46.1	35.0	50.8	23.7	126	156	282	85.8	312
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.290	<0.2	0.330	< 0.89	<1.22	<0.49	0.780
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	5.40
Cadmium (Cd)	mg/kg	0.600	3.50	0.173	0.190	0.445	0.0850	0.0740	0.893	0.967	0.635	0.918
Calcium (Ca)	mg/kg	-	-	3,800	3,010	3,320	1,050	518	11,180	11,698	6,330	12,000
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	0.900	3.77	11.0	<10.2	<21.2	<5.9	11.6
Cobalt (Co)	mg/kg	-	-	0.240	0.710	4.17	1.03	2.78	6.15	8.93	4.88	11.1
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.650	7.32	12.6	<8.97	<21.6	<1.15	20.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,680	1,960	10,400	<5,740	<16,140	<3,730	19,500
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.19	0.880	6.99	<5.07	<12.1	<3.69	13.6
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	6.40	<20	<26.4	<10	12.4
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,920
Manganese (Mn)	mg/kg	460	1,100	56.7	96.6	191	17.1	39.9	361	401	288	622
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0668
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	< 0.5	<0.5	<0.5	1.07	<2	<3.07	<1	1.42
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	10.6	6.02	11.4	<19.1	<30.5	<12.6	33.1
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	142	-	-	<242	<242	<192	1,300
Potassium (K)	mg/kg	-	-	130	-	-	-	-	130	130	-	1,500
Selenium (Se) b	mg/kg	2.	00	<0.2	<0.2	<0.2	1.01	0.350	<1.61	<1.96	<0.4	1.22
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.100	<0.1	0.140	<0.4	<0.54	<0.2	0.270
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	56.0
Strontium (Śr)	mg/kg	-	-	12.6	5.80	6.63	4.64	20.8	29.7	50.5	12.4	47.8
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	< 0.05	< 0.05	<0.05	<0.05	0.145	<0.2	<0.345	<0.1	0.140
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	2.20	24.8	<9.2	<34	<6	10.1
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	< 0.05	0.0510	0.178	0.279	0.339	<0.558	<0.897	0.229	0.845
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.90	4.45	28.6	<7.75	<36.4	<3.1	26.5
Zinc (Zn)	mg/kg	123	315	<1	4.70	26.4	9.10	59.9	<41.2	<101	31.1	113

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.12: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GAUT-3 on Gardine Creek, September 2022

		BC W	SQG ^a				SI	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	579	2,260	5,480	<2,939	<8,419	<629	6,860
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.730	<0.4	<1.13	<0.2	0.860
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.105	0.686	0.886	<5	<1.73	<6.73	0.791	5.22
Barium (Ba)	mg/kg	-	-	55.9	31.3	50.9	25.6	114	164	278	82.2	306
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.350	<0.2	0.320	< 0.95	<1.27	<0.55	0.730
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	5.40
Cadmium (Cd)	mg/kg	0.600	3.50	0.201	0.190	0.560	0.118	0.0600	1.07	1.13	0.750	0.978
Calcium (Ca)	mg/kg	-	-	5,520	2,990	3,460	1,140	173	13,110	13,283	6,450	13,400
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.750	5.43	7.90	<11.7	<19.6	<5.75	11.1
Cobalt (Co)	mg/kg	-	-	0.300	0.790	3.18	1.40	2.18	5.67	7.85	3.97	7.57
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.530	12.9	10.8	<14.4	<25.2	<1.03	21.6
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,310	2,960	6,430	<6,370	<12,800	<3,360	12,700
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	2.82	1.90	6.04	<5.72	<11.8	<3.32	11.6
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	8.90
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,420
Manganese (Mn)	mg/kg	460	1,100	109	107	118	15.0	26.5	349	376	225	357
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0898
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.860	<2	<2.86	<1	1.27
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	9.49	8.69	8.30	<20.7	<29	<11.5	25.8
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	180	-	-	<280	<280	<230	1,020
Potassium (K)	mg/kg	-	-	140	-	-	-	-	140	140	-	1,380
Selenium (Se) b	mg/kg	2.	00	<0.2	<0.2	<0.2	1.64	0.430	<2.24	<2.67	<0.4	1.57
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.280	<0.4	<0.68	<0.2	0.370
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	54.0
Strontium (Sr)	mg/kg	-	-	16.8	5.60	6.87	4.86	19.1	34.1	53.2	12.5	50.7
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	<0.05	< 0.05	<0.05	<0.05	0.118	<0.2	<0.318	<0.1	0.135
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	3.90	24.6	<10.9	<35.5	<6	13.0
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	<0.05	0.0760	0.217	0.432	0.281	<0.775	<1.06	0.293	1.00
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.42	6.59	23.0	<9.41	<32.4	<2.62	24.4
Zinc (Zn)	mg/kg	123	315	<1	4.60	26.1	14.6	45.8	<46.3	<92.1	30.7	90.7

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.13: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GAUT-4 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	628	2,000	6,410	<2,728	<9,138	<678	9,840
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.690	<0.4	<1.09	<0.2	0.970
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.0680	0.550	0.596	<5	<1.26	<6.26	0.618	6.81
Barium (Ba)	mg/kg	-	-	48.6	36.2	53.6	25.3	126	164	290	89.8	347
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.300	<0.2	0.310	<0.9	<1.21	<0.5	0.810
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	8.20
Cadmium (Cd)	mg/kg	0.600	3.50	0.166	0.193	0.489	0.0940	0.0730	0.942	1.01	0.682	0.958
Calcium (Ca)	mg/kg	-	-	4,470	2,870	3,300	1,140	348	11,780	12,128	6,170	12,700
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.750	4.21	9.20	<10.5	<19.7	<5.75	14.6
Cobalt (Co)	mg/kg	-	-	0.220	0.800	4.08	1.24	2.70	6.34	9.04	4.88	10.7
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.570	8.60	11.9	<10.2	<22.1	<1.07	21.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,680	2,380	9,620	<6,160	<15,780	<3,730	18,800
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.05	1.14	6.94	<5.19	<12.1	<3.55	13.4
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	5.40	<20	<25.4	<10	12.3
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	4,090
Manganese (Mn)	mg/kg	460	1,100	59.6	111	195	19.4	38.0	385	423	306	508
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0737
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.900	<2	<2.9	<1	1.45
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	10.8	6.96	10.4	<20.3	<30.7	<12.8	33.3
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	132	-	-	<232	<232	<182	1,270
Potassium (K)	mg/kg	-	-	150	-	-	-	-	150	150	-	2,060
Selenium (Se) b	mg/kg	2.	00	<0.2	<0.2	<0.2	1.17	0.480	<1.77	<2.25	<0.4	1.49
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.180	<0.4	<0.58	<0.2	0.300
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	66.0
Strontium (Sr)	mg/kg	ı	-	15.0	5.70	6.72	4.95	18.1	32.4	50.5	12.4	52.4
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	< 0.05	<0.05	< 0.05	<0.05	0.122	<0.2	<0.322	<0.1	0.167
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	2.30	19.4	<9.3	<28.7	<6	18.3
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (U)	mg/kg	-	-	<0.05	0.0590	0.188	0.329	0.291	<0.626	<0.917	0.247	0.941
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.63	5.37	24.3	<8.4	<32.7	<2.83	33.6
Zinc (Zn)	mg/kg	123	315	<1	5.30	26.8	10.5	57.7	<43.6	<101	32.1	124

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.14: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GAUT-5 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA F	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	592	1,950	7,120	<2,642	<9,762	<642	10,600
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.740	<0.4	<1.14	<0.2	0.880
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	<0.05	0.535	0.723	<5	<1.36	<6.36	<0.585	6.46
Barium (Ba)	mg/kg	-	-	46.8	34.7	54.6	25.1	130	161	291	89.3	370
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.270	<0.2	0.360	<0.87	<1.23	<0.47	0.810
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	9.50
Cadmium (Cd)	mg/kg	0.600	3.50	0.177	0.175	0.422	0.0800	0.0790	0.854	0.933	0.597	0.891
Calcium (Ca)	mg/kg	-	-	4,530	3,010	3,270	1,120	403	11,930	12,333	6,280	12,200
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.710	4.05	10.0	<10.3	<20.3	<5.71	14.9
Cobalt (Co)	mg/kg	-	-	0.170	0.600	3.72	1.18	2.54	5.67	8.21	4.32	10.3
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.550	8.14	11.0	<9.69	<20.7	<1.05	20.4
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,560	2,490	8,610	<6,150	<14,760	<3,610	18,700
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	2.86	1.22	6.40	<5.08	<11.5	<3.36	12.7
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	5.60	<20	<25.6	<10	13.1
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	4,100
Manganese (Mn)	mg/kg	460	1,100	40.4	97.1	262	23.4	34.5	423	457	359	486
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0748
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.940	<2	<2.94	<1	1.34
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	10.8	6.78	9.90	<20.1	<30	<12.8	31.2
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	143	-	-	<243	<243	<193	1,300
Potassium (K)	mg/kg	-	-	140	-	-	-	-	140	140	-	2,270
Selenium (Se) b	mg/kg	2.	00	<0.2	<0.2	<0.2	1.11	0.460	<1.71	<2.17	<0.4	1.32
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.160	<0.4	<0.56	<0.2	0.270
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	70.0
Strontium (Sr)	mg/kg	-	-	14.6	5.60	6.59	4.97	19.2	31.8	51	12.2	50.6
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	< 0.05	<0.05	<0.05	< 0.05	0.155	<0.2	<0.355	<0.1	0.169
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	2.40	25.2	<9.4	<34.6	<6	17.6
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	<0.05	0.0670	0.195	0.338	0.325	< 0.65	< 0.975	0.262	0.881
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.64	5.32	26.9	<8.36	<35.3	<2.84	34.0
Zinc (Zn)	mg/kg	123	315	<1	4.70	24.4	10.2	54.4	<40.3	<94.7	29.1	110

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.15: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GANF-1 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA I	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	598	1,630	6,540	<2,328	<8,868	<648	8,260
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.690	<0.4	<1.09	<0.2	0.750
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.0880	0.536	0.460	<5	<1.13	<6.13	0.624	5.56
Barium (Ba)	mg/kg	-	-	22.9	52.8	39.3	23.6	132	139	271	92.1	225
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.290	<0.2	0.310	< 0.89	<1.2	<0.49	0.700
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	8.70
Cadmium (Cd)	mg/kg	0.600	3.50	0.109	0.295	0.396	0.0730	0.0750	0.873	0.948	0.691	0.727
Calcium (Ca)	mg/kg	-	-	3,750	41,800	7,900	1,220	423	54,670	55,093	49,700	59,300
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.820	3.62	9.40	<9.94	<19.3	<5.82	11.9
Cobalt (Co)	mg/kg	-	-	0.260	0.920	3.44	1.02	2.45	5.64	8.09	4.36	7.31
Copper (Cu)	mg/kg	35.7	197	1.09	<0.5	<0.5	7.33	12.2	<9.42	<21.6	<1	15.7
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,580	1,970	8,370	<5,650	<14,020	<3,630	14,500
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.34	1.12	5.93	< 5.46	<11.4	<3.84	10.7
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	5.10	<20	<25.1	<10	11.6
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,620
Manganese (Mn)	mg/kg	460	1,100	86.0	104	105	10.9	32.5	306	338	209	380
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0509
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.810	<2	<2.81	<1	1.24
Nickel (Ni)	mg/kg	16.0	75.0	0.500	2.10	10.0	5.95	9.30	18.6	27.8	12.1	25.4
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	180	-	-	<280	<280	<230	976
Potassium (K)	mg/kg	-	-	160	-	-	-	-	160	160	-	2,030
Selenium (Se) b	mg/kg	2.0	00	<0.2	<0.2	<0.2	1.55	0.450	<2.15	<2.6	<0.4	1.54
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.190	<0.4	<0.59	<0.2	0.300
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	69.0
Strontium (Śr)	mg/kg	-	-	7.35	24.9	7.78	4.34	20.7	44.4	65.1	32.7	64.0
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,100
Thallium (TI)	mg/kg	-	-	< 0.05	<0.05	<0.05	< 0.05	0.129	<0.2	< 0.329	<0.1	0.154
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	17.1	14.3	<24.1	<38.4	<6	15.0
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	<0.05	0.168	0.191	0.255	0.251	< 0.664	<0.915	0.359	0.815
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.77	4.97	23.3	<8.14	<31.4	<2.97	27.5
Zinc (Zn)	mg/kg	123	315	<1	6.90	31.3	7.90	52.0	<47.1	<99.1	38.2	90.7

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.16: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GANF-2 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA F	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	490	1,630	6,910	<2,220	<9,130	<540	8,980
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.620	<0.4	<1.02	<0.2	0.580
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.0660	0.450	0.446	<5	<1.01	<6.01	0.516	5.28
Barium (Ba)	mg/kg	-	-	25.9	52.3	32.0	23.4	106	134	240	84.3	229
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.280	<0.2	0.330	<0.88	<1.21	<0.48	0.740
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	9.00
Cadmium (Cd)	mg/kg	0.600	3.50	0.102	0.231	0.335	0.0670	0.0730	0.735	0.808	0.566	0.689
Calcium (Ca)	mg/kg	-	-	3,620	43,600	10,300	1,410	454	58,930	59,384	53,900	58,600
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.740	3.30	9.70	<9.54	<19.2	<5.74	12.4
Cobalt (Co)	mg/kg	-	-	0.270	0.750	3.28	0.920	2.54	5.22	7.76	4.03	7.68
Copper (Cu)	mg/kg	35.7	197	1.05	<0.5	0.520	6.69	11.1	<8.76	<19.9	<1.02	14.7
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,220	2,030	8,960	<5,350	<14,310	<3,270	16,300
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.30	0.880	5.71	<5.18	<10.9	<3.8	10.7
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	6.20	<20	<26.2	<10	12.6
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,750
Manganese (Mn)	mg/kg	460	1,100	94.9	116	146	13.6	35.0	370	406	262	478
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0391
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.900	<2	<2.9	<1	1.09
Nickel (Ni)	mg/kg	16.0	75.0	0.530	2.00	9.36	5.73	9.60	17.6	27.2	11.4	24.7
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	132	-	-	<232	<232	<182	1,010
Potassium (K)	mg/kg	-	-	150	-	-	-	-	150	150	-	2,090
Selenium (Se) b	mg/kg	2.0	00	<0.2	<0.2	<0.2	1.19	0.540	<1.79	<2.33	<0.4	1.21
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.130	<0.4	<0.53	<0.2	0.210
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	74.0
Strontium (Śr)	mg/kg	-	-	7.85	24.8	8.12	4.67	19.2	45.4	64.6	32.9	64.9
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,100
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	<0.05	<0.05	0.128	<0.2	<0.328	<0.1	0.159
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	17.4	16.8	<24.4	<41.2	<6	14.2
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	<0.05	0.158	0.152	0.233	0.254	<0.593	<0.847	0.310	0.763
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.36	4.38	23.6	<7.14	<30.7	<2.56	28.2
Zinc (Zn)	mg/kg	123	315	<1	5.30	25.8	7.30	52.1	<39.4	<91.5	31.1	88.5

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.17: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GANF-3 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA R	esults				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	431	1,310	6,860	<1,841	<8,701	<481	6,830
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.630	<0.4	<1.03	<0.2	0.630
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	< 0.05	0.357	0.319	<5	<0.776	<5.78	<0.407	4.55
Barium (Ba)	mg/kg	-	-	16.8	50.7	47.6	22.2	110	137	247	98.3	212
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.270	<0.2	0.340	<0.87	<1.21	<0.47	0.590
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	6.00
Cadmium (Cd)	mg/kg	0.600	3.50	0.112	0.232	0.306	0.0620	0.0830	0.712	0.795	0.538	0.681
Calcium (Ca)	mg/kg	-	-	3,170	47,500	28,200	1,840	662	80,710	81,372	75,700	82,100
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.910	2.56	9.40	<8.97	<18.4	<5.91	9.78
Cobalt (Co)	mg/kg	-	-	0.160	0.540	4.14	0.920	2.68	5.76	8.44	4.68	7.02
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.570	5.16	11.7	<6.73	<18.4	<1.07	14.4
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	2,990	1,520	11,000	<4,610	<15,610	<3,040	12,700
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	4.24	<0.5	5.57	<5.74	<11.3	<4.74	9.64
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	6.50	<20	<26.5	<10	10.5
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,830
Manganese (Mn)	mg/kg	460	1,100	45.3	87.2	292	14.3	44.8	439	484	379	402
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0448
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.880	<2	<2.88	<1	1.09
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	10.2	5.20	10.0	<17.9	<27.9	<12.2	23.1
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	61.0	-	-	<161	<161	<111	846
Potassium (K)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	1,590
Selenium (Se) b	mg/kg	2.0	00	<0.2	<0.2	<0.2	0.960	0.460	<1.56	<2.02	<0.4	1.21
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.120	<0.4	<0.52	<0.2	0.240
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	70.0
Strontium (Sr)	mg/kg	-	-	4.94	25.5	16.9	5.13	19.1	52.5	71.6	42.4	70.1
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,500
Thallium (TI)	mg/kg	-	-	<0.05	< 0.05	<0.05	< 0.05	0.128	<0.2	<0.328	<0.1	0.131
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	1.90	15.1	<8.9	<24	<6	11.6
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	<0.05	0.152	0.187	0.192	0.302	<0.581	<0.883	0.339	0.747
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.45	3.45	23.3	<6.3	<29.6	<2.65	22.5
Zinc (Zn)	mg/kg	123	315	<1	4.40	26.6	5.80	58.4	<37.8	<96.2	31.0	79.2

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.18: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GANF-4 on Gardine Creek, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	458	1,400	5,760	<1,958	<7,718	<508	5,980
Antimony (Sb)	mg/kg	-	_	<0.1	<0.1	<0.1	<0.1	0.710	<0.4	<1.11	<0.2	0.680
Arsenic (As)	mg/kg	5.90	17.0	<0.05	<0.05	0.366	0.495	<5	<0.961	<5.96	<0.416	4.24
Barium (Ba)	mg/kg	-	-	20.4	54.0	45.0	23.3	114	143	257	99.0	216
Beryllium (Be)	mg/kg	_	-	<0.2	<0.2	0.320	<0.2	0.310	<0.92	<1.23	<0.52	0.590
Bismuth (Bi)	mg/kg	_	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	_	-	-	-	-	-	-	-	-	-	<5
Cadmium (Cd)	mg/kg	0.600	3.50	0.143	0.272	0.388	0.0810	0.0640	0.884	0.948	0.660	0.711
Calcium (Ca)	mg/kg	_	-	3,580	45,200	30,600	1,990	313	81,370	81,683	75,800	83,100
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.980	3.12	8.30	<9.6	<17.9	<5.98	8.86
Cobalt (Co)	mg/kg	_	-	0.230	0.710	3.69	0.830	2.33	5.46	7.79	4.40	6.79
Copper (Cu)	mg/kg	35.7	197	1.04	<0.5	0.670	8.19	11.6	<10.4	<22	<1.17	14.9
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	2,980	1,560	7,230	<4,640	<11,870	<3,030	10,800
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	4.38	0.640	5.08	<6.02	<11.1	<4.88	9.43
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	9.40
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,580
Manganese (Mn)	mg/kg	460	1,100	46.7	85.3	151	9.00	29.6	292	322	236	346
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0610
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.820	<2	<2.82	<1	1.18
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	9.97	5.53	8.70	<18	<26.7	<12	21.9
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	53.0	-	-	<153	<153	<103	831
Potassium (K)	mg/kg	-	-	160	-	-	-	-	160	160	-	1,390
Selenium (Se) b	mg/kg	2.0	00	<0.2	<0.2	<0.2	1.21	0.340	<1.81	<2.15	<0.4	1.31
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.110	<0.1	0.160	<0.41	<0.57	<0.21	0.250
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	66.0
Strontium (Sr)	mg/kg	-	-	5.71	24.9	18.9	5.32	20.5	54.8	75.3	43.8	72.0
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,600
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	< 0.05	<0.05	0.111	<0.2	<0.311	<0.1	0.112
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	16.4	15.6	<23.4	<39	<6	10.8
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	< 0.05	0.148	0.190	0.232	0.250	<0.62	<0.87	0.338	0.751
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.86	4.50	21.5	<7.76	<29.3	<3.06	21.2
Zinc (Zn)	mg/kg	123	315	<1	4.10	30.7	7.40	50.7	<43.2	<93.9	34.8	78.0

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.19: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GANF-5 on Gardine Creek, September 2022

		BC W	SQG ^a				SEA	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	470	1,520	5,490	<2,090	<7,580	<520	6,680
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.630	<0.4	<1.03	<0.2	0.670
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	< 0.05	0.382	0.479	<5	<0.961	<5.96	<0.432	5.46
Barium (Ba)	mg/kg	-	-	21.0	51.0	37.0	22.7	103	132	235	88.0	206
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.290	<0.2	0.300	<0.89	<1.19	<0.49	0.660
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	<5
Cadmium (Cd)	mg/kg	0.600	3.50	0.142	0.272	0.372	0.0770	0.0620	0.863	0.925	0.644	0.714
Calcium (Ca)	mg/kg	-	-	4,010	43,600	17,600	1,740	389	66,950	67,339	61,200	65,600
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.800	3.24	7.80	<9.54	<17.3	<5.8	9.80
Cobalt (Co)	mg/kg	-	-	0.200	0.590	3.48	0.970	2.19	5.24	7.43	4.07	8.27
Copper (Cu)	mg/kg	35.7	197	1.02	<0.5	<0.5	7.78	10.7	<9.8	<20.5	<1	16.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,020	1,860	7,230	<4,980	<12,210	<3,070	15,600
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.57	0.920	5.37	<5.49	<10.9	<4.07	11.1
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	11.3
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,930
Manganese (Mn)	mg/kg	460	1,100	53.1	98.3	179	11.8	29.7	342	372	277	516
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0532
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.790	<2	<2.79	<1	1.23
Nickel (Ni)	mg/kg	16.0	75.0	<0.5	<2	9.66	5.96	8.30	<18.1	<26.4	<11.7	25.8
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	76.0	-	-	<176	<176	<126	1,000
Potassium (K)	mg/kg	-	-	150	-	-	-	-	150	150	-	1,360
Selenium (Se) b	mg/kg	2.0	00	<0.2	<0.2	<0.2	1.25	0.390	<1.85	<2.24	<0.4	1.19
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.100	<0.1	0.160	<0.4	<0.56	<0.2	0.220
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	67.0
Strontium (Sr)	mg/kg	-	-	6.52	24.3	11.7	4.84	18.9	47.4	66.3	36.0	62.9
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,200
Thallium (TI)	mg/kg	-	-	< 0.05	< 0.05	<0.05	< 0.05	0.102	<0.2	<0.302	<0.1	0.124
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	16.5	12.8	<23.5	<36.3	<6	11.8
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	< 0.05	0.145	0.181	0.235	0.240	<0.611	<0.851	0.326	0.792
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.42	4.32	19.6	<7.14	<26.7	<2.62	22.3
Zinc (Zn)	mg/kg	123	315	<1	4.50	27.7	7.90	47.8	<41.1	<88.9	32.2	91.8

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.20: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, 2019 to 2022

			а											Area	Magnitude o	f Differenc	е							
	ANOV	/A Model							Area E	ffects ^b								Area Effect	s by Year ^c					
			Assumed				RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT	DC CUD	BC CUB	RG GHP	-	DC CUD	DC CALL	DC CUD	DC CUD		)20	RG GHB	DC CALL
	Constituent	Units	Distribution	Area	Year	Area:Year		VS DC CAUT	VS DC CANE	VS DC CAUT	VS DC CANE	VS DC CANE	VS	VS	VS	P vs	P vs	T vs	VS	VS	VS	P vs	P vs	T vs
							RG_GHBP	RG_GAUT	RG_GANF	RG_GAUT	RG_GANF	KG_GANF	RG_GHB	RG_GAU	RG_GAN	RG_GAU	RG_GAN	RG_GAN	RG_GHB	RG_GAU	RG_GAN	RG_GAU	RG_GAN	RG_GAN
	Moisture	%	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	-25.8	-25.6	-40.7	-40.5	ns	55.9	ns	ns	-49.2	-28.8	40.2
	pH (1:2 soil:water)	pH units	lognormal	0.848	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-4.55	3.83	ns	8.78	6.24	-2.33	nc	nc	nc	nc	nc	nc
	Silt (0.0312 mm to 0.004 mm)	%	lognormal	<0.001	0.053	<0.001	nc	nc	nc	nc	nc	nc	-47.0	-66.8	-50.9	-37.3	ns	47.5	ns	-80.2	-54.9	-73.5	-39.9	127
	Silt (0.063 mm to 0.0312 mm)	%	lognormal	0.001	0.900	<0.001	nc	nc	nc	nc	nc	nc	74.0	ns	92.9	ns	ns	ns	101	-41.0	74.5	-70.7	ns	196
	Clay (<4 µm)	%	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	-74.8	-84.7	-82.6	-39.1	-31.0	ns	-57.3	-85.5	-83.1	-66.1	-60.3	ns
Physical Tests	Sand (0.125 mm to 0.063 mm)	%	lognormal	<0.001	0.781	<0.001	nc	nc	nc	nc	nc	nc	631	839	828	ns	ns	ns	302	530	1,529	ns	305	159
	Sand (0.25 mm to 0.125 mm)	%	lognormal	<0.001	0.902	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	105	ns	ns	542	1,867	2,820	206	355	ns
	Sand (0.50 mm to 0.25 mm)	%	lognormal	<0.001	0.710	0.020	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	420	163	ns
	Sand (1.00 mm to 0.50 mm)	%	lognormal	<0.001	0.413	0.578	ns	ns	ns	134	ns	-52.1	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sand (2.00 mm to 1.00 mm)	%	lognormal	<0.001	0.140	0.366	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Gravel (>2 mm)	%	lognormal	<0.001	0.565	0.708	ns	ns	ns	175	ns	-72.8	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Organic Carbon	Total Organic Carbon	%	lognormal	<0.001	0.004	<0.001	nc	nc	nc	nc	nc	nc	ns	-56.4	-49.1	-40.5	ns	ns	ns	-66.1	-51.0	-60.1	-42.3	ns
	Aluminum (Al)	mg/kg	lognormal	<0.001	<0.001	0.083	-33.0	ns	-18.7	56.5	21.4	-22.4	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Antimony (Sb)	mg/kg	lognormal	<0.001	0.010	0.008	nc	nc	nc	nc	nc	nc	-43.8	-27.7	-51.8	ns	ns	-33.3	-31.8	ns	-47.8	ns	ns	-29.5
	Arsenic (As)	mg/kg	lognormal	<0.001	0.005	0.200	-31.1	ns	-22.1	52.6	ns	-25.9	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Barium (Ba)	mg/kg	lognormal	<0.001	<0.001	0.018	nc	nc	nc	nc	nc	nc	-37.3	-25.7	-27.0	ns	ns	ns	-31.6	ns	-23.7	ns	ns	ns
	Beryllium (Be)	mg/kg	lognormal	<0.001	0.270	0.187	-36.6	ns	-25.0	47.8	ns	-20.0	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Boron (B)	mg/kg	lognormal	0.006	<0.001	0.186	25.4	33.5	ns	ns	ns	-18.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cadmium (Cd)	mg/kg	lognormal	<0.001	0.569	0.010	nc	nc	nc	nc	nc	nc	-32.6	-53.7	-57.4	-31.2	-36.8	ns	ns	-55.1	-58.2	-55.2	-58.4	ns
	Calcium (Ca)	mg/kg	lognormal	<0.001	0.655	0.088	ns	-77.9	ns	-83.5	ns	499	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Chromium (Cr)	mg/kg	lognormal	<0.001	<0.001	0.376	-29.6	ns	-24.8	33.0	ns	-19.8	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cobalt (Co)	mg/kg	lognormal	<0.001	0.002	0.160	-32.2	ns	-29.9	61.1	ns	-35.8	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Copper (Cu)	mg/kg	lognormal	<0.001	0.332	0.040	nc	nc	nc	nc	nc	nc	-50.0	-42.0	-51.5	ns	ns	ns	-37.3	-43.7	-55.0	ns	-28.2	ns
	Iron (Fe)	mg/kg	lognormal	<0.001	0.032	0.051	ns	36.3	ns	63.6	ns	-28.8	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Metals	Lead (Pb)	mg/kg	lognormal	<0.001	0.111	0.080	-35.2	ns	-30.9	43.6	ns	-25.7	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Lithium (Li)	mg/kg	lognormal	<0.001	0.171	0.009	nc	nc	nc	nc	nc	nc	ns	55.7	ns	99.1	61.8	ns	ns	57.1	ns	94.8	41.7	-27.2
	Magnesium (Mg)	mg/kg	lognormal	<0.001	<0.001	0.157	15.6	-29.9	-18.0	-39.4	-29.1	17.0	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Manganese (Mn)	mg/kg	lognormal	0.002	0.465	0.737	ns	40.6	ns	ns	ns	-21.4	nc	nc	nc	nc	nc	nc	nc	nc 46.4	nc	nc	nc	nc
	Mercury (Hg)	mg/kg	lognormal	<0.001	<0.001	0.001	nc	nc	nc	nc	nc	nc	-59.9	-56.8	-51.5	ns	ns	ns	-35.5	-46.4	-51.4	ns	ns	ns
	Molybdenum (Mo)	mg/kg	lognormal	<0.001	0.027	0.186	-29.0	-28.9	-41.6	ns	-17.8	-17.9	nc	nc	nc	nc 20.4	nc	nc	nc	nc	nc	nc	nc	nc
	Nickel (Ni)	mg/kg	lognormal	<0.001			nc	nc	nc	nc	nc	nc 16.5	ns	ns	-47.6	-36.4	-58.4	-34.6	109	-30.5	-53.3	-66.7	-77.6	-32.8
	Phosphorus (P)	mg/kg	lognormal	0.001	0.007		ns	18.8	ns	23.9	ns	-16.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Potassium (K)	mg/kg	lognormal	<0.001			-32.2	ns	-28.9	28.2	ns	-18.2	nc	nc	nc	nc 93.4	nc	nc	nc	nc 00.1	nc	nc 04.9	nc 04.4	nc
	Selenium (Se)	mg/kg	lognormal	<0.001		0.001	nc 48.0	nc	nc 45.0	nc	nc	nc	ns	-86.6	-90.3	-83.1	-87.8	ns	ns	-90.1	-89.3	-94.8	-94.4	ns
	Silver (Ag)	mg/kg	lognormal	<0.001		0.162	-48.9	-38.3	-45.8	20.9	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sodium (Na)	mg/kg	lognormal	0.002	<0.001		nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	34.0	ns	ns	-21.4	ns	ns
	Strontium (Sr)	mg/kg	lognormal	<0.001		0.216	ns	-23.4	ns	ns	ns	36.7	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc 46.0	nc
	Sulphur (S)	mg/kg	lognormal	<0.001	0.474	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	137	ns	ns	ns	-46.9	ns

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}/EMM_{station 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05) . The EMM is the estimated marginal mean from the censored regression model.

[°] The MOD was calculated as[EMM_{station 2}- EMM_{station 1}]/EMM_{station 1}*100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.20: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, 2019 to 2022

	ANO	VA Model	a											Area l	Magnitude	of Differenc								
	ANO	VA WIOUEI				T.			Area E	ffects ^b					-	140		Area Effect	s by Year ^c		-	120		
	Constituent	Units	Assumed Distribution	Area	Year	Area:Year	RG_GHP vs RG_GHBI	vs	RG_GHP vs RG_GANF	vs	vs	vs	RG_GHP vs RG_GHB	RG_GHP vs RG_GAU		RG_GHB P vs RG_GAU	P vs	RG_GAU T vs RG_GAN	vs	vs	RG_GHP vs	P vs	RG_GHB P vs RG_GAN	T vs
	Thallium (TI)	mg/kg	lognormal	<0.001	<0.001	0.081	30.5	30.8	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Tin (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	nc	nc	nc	nc	nc	nc	36.4	113	ns	55.9	-35.0	-58.3	ns	ns	ns	ns	ns	ns
	Titanium (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	nc	nc	nc	nc	nc	nc	36.4	113	ns	55.9	-35.0	-58.3	ns	ns	ns	ns	ns	ns
Metals	Uranium (U)	mg/kg	lognormal	<0.001	0.515	0.003	nc	nc	nc	nc	nc	nc	ns	-39.9	-43.6	-46.4	-49.6	ns	65.3	-45.0	-34.3	-66.7	-60.2	ns
	Vanadium (V)	mg/kg	lognormal	<0.001	<0.001	0.164	-38.7	ns	-33.6	38.2	ns	-21.6	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Zinc (Zn)	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	-26.7	-24.7	-40.7	ns	-19.1	-21.2	ns	-28.0	-45.0	-37.9	-52.5	-23.6
	Zirconium (Zr)	mg/kg	lognormal	0.022	<0.001	0.100	ns	ns	ns	ns	ns	-20.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Acenaphthylene	mg/kg	lognormal	0.002	<0.001	0.454	-59.6	-63.7	-50.7	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Benz(a)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-69.7	ns	ns	ns	ns	-83.5	ns	-78.6	ns	ns
	Benzo(a)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-65.6	-88.3	-60.4	-66.1	ns	239	ns	-86.8	-75.3	-81.4	-65.1	ns
	Benzo(b&j)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-62.0	-85.9	-62.3	-62.8	ns	167	ns	-83.2	-71.6	-68.7	ns	ns
	Benzo(b+j+k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-62.6	-85.7	-61.7	-61.7	ns	167	ns	-83.8	-71.7	-69.3	ns	ns
	Benzo(e)pyrene	mg/kg	lognormal	<0.001	<0.001	0.003	nc	nc	nc	nc	nc	nc	-62.8	-86.7	-60.9	-64.3	ns	194	ns	-83.4	-72.0	-72.4	-53.5	ns
	Benzo(g,h,i)perylene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	-81.2	-68.9	-66.3	ns	ns	ns	-80.5	-65.6	-74.9	-55.8	ns
	Benzo(k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-58.9	ns	ns	ns	ns	-78.3	-68.5	-68.0	-53.5	ns
Polyovolio	Chrysene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-65.0	-86.8	-72.3	-62.3	ns	111	ns	-80.8	-59.4	-75.5	ns	ns
Polycyclic Aromatic	Dibenz(a,h)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-68.7	ns	ns	ns	ns	-84.0	-73.4	-71.8	-53.1	ns
Hydrocarbons	Fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-62.4	-87.2	-78.7	-65.8	ns	ns	ns	-86.9	-77.6	-76.8	-60.4	ns
	Fluorene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-64.8	-88.6	-74.8	-67.7	ns	122	ns	-89.6	-81.9	-81.2	-67.1	ns
	Indeno(1,2,3-c,d)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-69.7	ns	-82.2	ns	ns	ns	ns	-83.0	-72.5	-76.9	-62.6	ns
	1-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-64.7	-86.7	-71.4	-62.2	ns	114	ns	-86.8	-78.0	-74.4	-57.1	ns
	2-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-65.5	-86.8	-71.8	-61.7	ns	113	ns	-86.2	-77.1	-73.2	-55.6	ns
	Naphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-66.1	-87.6	-73.1	-63.4	ns	117	ns	-86.3	-77.8	-73.1	-56.2	ns
	Perylene	mg/kg	lognormal	0.019	<0.001	0.364	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Phenanthrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-61.0	-86.7	-73.1	-65.9	ns	103	ns	-85.7	-77.6	-71.3	-55.0	ns
	Pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-58.8	-79.1	-72.0	-49.4	ns	ns	-53.7	-82.5	-71.2	-62.2	ns	ns

P-value <0.0

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area:Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

The MOD was calculated as [EMM_{station 2}- EMM_{station 1}*100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.20: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, 2019 to 2022

	ANOV	A Model ^a										Area Magnitud	e of Differenc	е				
	AIGU	A WIOGEI	1	1	I	1						Area Effect	ts by Year ^c					
			Assumed					T		)21	T			T	20	)22	T	
	Constituent	Units	Distribution	Area	Year	Area:Year	RG_GHP vs RG_GHBP	RG_GHP vs RG_GAUT	RG_GHP vs RG_GANF		RG_GHBP vs RG_GANF	RG_GAUT vs RG_GANF	RG_GHP vs RG_GHBP	RG_GHP vs RG_GAUT	RG_GHP vs RG_GANF	RG_GHBP vs RG_GAUT	RG_GHBP vs RG_GANF	RG_GAUT vs RG_GANF
	Moisture	%	lognormal	<0.001	<0.001	<0.001	34.6	ns	ns	-32.5	ns	31.1	-22.9	-57.1	-31.2	-44.3	ns	60.2
	pH (1:2 soil:water)	pH units	lognormal	0.848	<0.001	<0.001	ns	-8.10	-7.71	-7.42	-7.03	ns	4.52	2.91	2.99	ns	ns	ns
	Silt (0.0312 mm to 0.004 mm)	%	lognormal	<0.001	0.053	<0.001	-41.4	-71.9	-62.6	-52.1	-36.3	ns	-48.0	-42.6	-36.7	ns	ns	ns
	Silt (0.063 mm to 0.0312 mm)	%	lognormal	0.001	0.9	<0.001	70.5	ns	ns	-50.2	ns	ns	ns	ns	ns	ns	ns	ns
	Clay (<4 µm)	%	lognormal	<0.001	0.001	<0.001	-64.5	-77.2	-76.3	-35.8	-33.2	ns	-28.3	-69.5	-36.0	-57.5	ns	110
Physical Tests	Sand (0.125 mm to 0.063 mm)	%	lognormal	<0.001	0.781	<0.001	342	555	885	ns	123	ns	ns	177	139	ns	ns	ns
	Sand (0.25 mm to 0.125 mm)	%	lognormal	<0.001	0.902	<0.001	684	1,759	2,503	137	232	ns	598	458	702	ns	ns	ns
	Sand (0.50 mm to 0.25 mm)	%	lognormal	<0.001	0.71	0.02	ns	ns	ns	203	174	ns	966	1,020	846	ns	ns	ns
	Sand (1.00 mm to 0.50 mm)	%	lognormal	<0.001	0.413	0.578	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sand (2.00 mm to 1.00 mm)	%	lognormal	<0.001	0.14	0.366	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Gravel (>2 mm)	%	lognormal	<0.001	0.565	0.708	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Organic Carbon	Total Organic Carbon	%	lognormal	<0.001	0.003	<0.001	ns	-60.4	-51.1	-46.0	-33.2	ns	-45.8	-34.0	ns	ns	ns	ns
	Aluminum (AI)	mg/kg	lognormal	<0.001	<0.001	0.083	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Antimony (Sb)	mg/kg	lognormal	<0.001	0.01	0.008	-33.3	ns	ns	90.3	ns	-29.7	-44.2	ns	-42.8	ns	ns	ns
	Arsenic (As)	mg/kg	lognormal	<0.001	0.005	0.200	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Barium (Ba)	mg/kg	lognormal	<0.001	<0.001	0.018	-41.7	-25.5	-35.2	27.7	ns	ns	-40.7	ns	-31.6	74.8	ns	-34.1
	Beryllium (Be)	mg/kg	lognormal	<0.001	0.27	0.187	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Boron (B)	mg/kg	lognormal	0.006	<0.001	0.186	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cadmium (Cd)	mg/kg	lognormal	<0.001	0.569	0.01	ns	-42.3	-52.6	-37.2	-48.4	ns	ns	-32.9	-48.0	ns	-40.4	ns
	Calcium (Ca)	mg/kg	lognormal	<0.001	0.655	0.088	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Chromium (Cr)	mg/kg	lognormal	<0.001	<0.001	0.376	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cobalt (Co)	mg/kg	lognormal	<0.001	0.002	0.16	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Copper (Cu)	mg/kg	lognormal	<0.001	0.332	0.04	-32.1	-33.4	-50.6	ns	-27.3	-25.9	-34.9	ns	-36.2	33.3	ns	-26.4
	Iron (Fe)	mg/kg	lognormal	<0.001	0.032	0.051	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Metals	Lead (Pb)	mg/kg	lognormal	<0.001	0.111	0.08	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Wictais	Lithium (Li)	mg/kg	lognormal	<0.001	0.171	0.009	ns	43.8	ns	96.3	ns	-31.0	37.9	59.8	47.9	ns	ns	ns
	Magnesium (Mg)	mg/kg	lognormal	<0.001	<0.001	0.157	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Manganese (Mn)	mg/kg	lognormal	0.002	0.465	0.737	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Mercury (Hg)	mg/kg	lognormal	<0.001	<0.001	0.001	-37.1	-34.6	-37.2	ns	ns	ns	-53.4	ns	-46.1	71.1	ns	-32.5
	Molybdenum (Mo)	mg/kg	lognormal	<0.001	0.027	0.186	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Nickel (Ni)	mg/kg	lognormal	<0.001	<0.001	<0.001	57.6	-41.9	-63.8	-63.1	-77.0	-37.7	ns	-52.1	-63.0	-46.5	-58.7	-22.9
	Phosphorus (P)	mg/kg	lognormal	0.001	0.007	0.390	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Potassium (K)	mg/kg	lognormal	<0.001	<0.001	0.149	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Selenium (Se)	mg/kg	lognormal	<0.001	0.603	0.001	ns	-90.5	-87.6	-93.3	-91.4	ns	-74.6	-95.0	-95.2	-80.3	-81.2	ns
	Silver (Ag)	mg/kg	lognormal	<0.001	0.626	0.162	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sodium (Na)	mg/kg	lognormal	0.002	<0.001	0.045	ns	-21.8	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Strontium (Sr)	mg/kg	lognormal	<0.001	0.808	0.216	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sulphur (S)	mg/kg	lognormal	<0.001	0.474	<0.001	ns	-60.5	ns	-56.0	ns	135	-51.6	ns	ns	ns	ns	ns

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}/EMM_{station 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05) . The EMM is the estimated marginal mean from the censored regression model.

[°] The MOD was calculated as[EMM_{station 2}- EMM_{station 1}]/EMM_{station 1}*100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.20: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, 2019 to 2022

	ANOV	'A Model ^a	ı									Area Magnitud		е				
		1	1						20	)21		Area Effec	ts by Year ^c		20	)22		
	Constituent	Units	Assumed Distribution	Area	Year	Area:Year	RG_GHP vs RG_GHBP	RG_GHP vs RG_GAUT	RG_GHP vs RG_GANF	RG_GHBP vs RG_GAUT	RG_GHBP vs RG_GANF		RG_GHP vs RG_GHBP	RG_GHP vs RG_GAUT	RG_GHP vs	RG_GHBP	RG_GHBP vs RG_GANF	RG_GAUT vs
	Thallium (TI)	mg/kg	lognormal	<0.001	<0.001	0.081	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Tin (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	ns	112	64.7	129	78.0	ns	40.5	88.7	59.8	ns	ns	ns
	Titanium (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	ns	112	64.7	129	78.0	ns	40.5	88.7	59.8	ns	ns	ns
Metals	Uranium (U)	mg/kg	lognormal	<0.001	0.515	0.003	ns	-41.6	-34.7	-58.7	-53.8	ns	-36.9	-48.7	-55.7	ns	ns	ns
	Vanadium (V)	mg/kg	lognormal	<0.001	<0.001	0.164	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Zinc (Zn)	mg/kg	lognormal	<0.001	0.005	<0.001	ns	-28.4	-47.0	-30.8	-48.8	-26.0	ns	ns	-32.6	ns	-33.2	-22.2
	Zirconium (Zr)	mg/kg	lognormal	0.022	<0.001	0.100	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Acenaphthylene	mg/kg	lognormal	0.002	<0.001	0.454	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Benz(a)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	-77.3	-72.0	ns	ns	ns	ns
	Benzo(a)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-53.9	ns	-67.9	-58.6	ns	-81.2	-72.9	-56.4	ns	132	ns
	Benzo(b&j)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-49.1	ns	ns	ns	ns	-81.2	-70.5	-63.1	ns	96.0	ns
	Benzo(b+j+k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	-83.1	-72.8	-58.9	ns	142	ns
	Benzo(e)pyrene	mg/kg	lognormal	<0.001	<0.001	0.003	ns	ns	ns	-52.7	ns	ns	nc	nc	nc	nc	nc	nc
	Benzo(g,h,i)perylene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	-57.5	-53.3	ns	-72.6	-63.0	-62.2	ns	ns	ns
	Benzo(k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	ns	-61.0	ns	ns	ns	163
Polyovolio	Chrysene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	-78.3	-68.2	-56.3	ns	101	ns
Polycyclic Aromatic	Dibenz(a,h)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	-76.8	-71.1	-56.2	ns	ns	ns
Hydrocarbons	Fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-54.7	ns	ns	ns	ns	-73.0	-70.9	-50.5	ns	ns	ns
	Fluorene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-68.5	-56.1	-64.6	ns	ns	-80.2	-71.2	ns	ns	157	ns
	Indeno(1,2,3-c,d)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	ns	-70.8	-59.5	ns	ns	ns
	1-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-67.0	-53.6	-62.2	ns	ns	-79.1	-64.7	ns	ns	186	ns
	2-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-66.9	-52.9	-61.3	ns	ns	-79.6	-61.4	ns	ns	202	ns
	Naphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-70.4	-55.9	-64.9	ns	ns	-82.5	-60.5	ns	126	290	ns
	Perylene	mg/kg	lognormal	0.019	<0.001	0.364	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Phenanthrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-61.8	ns	-56.2	ns	ns	-73.0	-64.8	ns	ns	ns	ns
	Pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	ns	ns	-79.0	-65.6	-53.1	ns	123	ns

P-value <0.05.

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} *100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

c The MOD was calculated as[EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} 100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

														Are	a Magnitud	le of Differe	nce							
		ANOVA	Model ^a						Area E	ffects ^b								Area Effec	ts by Year ^c	:				
															20	)19					20	20		
Constituent	Fraction	Unito	Assumed	A #00	Voor	AraaiVaar	RG_GHP	RG_GHP			RG_GHBP		RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT	RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year		vs RG GAUT	vs RG_GANF	vs RG GAUT	vs RG GANF	vs RG GANF	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs
									_	_	_	_	RG_GHBP	RG_GAUT	RG_GANF	RG_GAUT	RG_GANF	RG_GANF	RG_GHBP	RG_GAUI	RG_GANF	RG_GAUT	RG_GANF	_
	Fraction 3	mg/kg	lognormal	<0.001	0.568	<0.001	nc	nc	nc	nc	nc	nc	-48.5	ns	-17.5	99.2	60.1	-19.6	-56.9	ns	-27.9	161	67.4	-35.9
Aluminum (AI)	Fraction 4	mg/kg	lognormal	<0.001	0.071	<0.001	nc	nc	nc	nc	nc	nc	-41.5	ns	ns	71.3	56.7	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.131	-16.0	ns	-11.9	33.7	ns	-21.6	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Antimony (Sb)	Fraction 5	mg/kg	lognormal	<0.001	0.310	<0.001	nc	nc	nc	nc	nc	nc	-40.9	-40.2	-47.2	ns	ns	ns	-39.5	ns	-46.4	61.3	ns	-45.0
	Fraction 2	mg/kg	lognormal	0.133	0.004	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.121	0.127	-34.9	-18.4	-33.1	25.4	ns	-18.0	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Arsenic (As)	Fraction 4	mg/kg	lognormal	0.665	0.066	0.029	nc	nc	nc	nc	nc	nc	ns	-43.7	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	nc	nc	nc	nc	nc	nc	-25.2	ns	ns	47.4	ns	ns	-46.2	ns	ns	121	39.3	-37.0
	Sum of 2 and 3	mg/kg	lognormal	0.003	0.014	0.008	nc	nc	nc	nc	nc	nc	-43.6	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	-39.4	66.6	ns	175	42.6	-48.1	-68.7	96.7	ns	528	148	-60.5
	Fraction 2	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	-33.8	-35.5	ns	ns	42.5	46.1	-36.4	-17.9	ns	29.1	71.2	32.7
	Fraction 3	mg/kg	lognormal	0.003	0.596	0.080	ns	ns	ns	27.6	ns	-18.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Barium (Ba)	Fraction 4	mg/kg	lognormal	0.002	0.012	<0.001	nc	nc	nc	nc	nc	nc	-31.5	-37.0	-41.0	ns	ns	ns	ns	-28.1	-38.5	-29.8	-39.9	ns
Bariam (Ba)	Fraction 5	mg/kg	lognormal	<0.001	0.500	0.105	-34.7	-27.0	-28.9	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.042	0.002	nc	nc	nc	nc	nc	nc	-20.4	ns	-16.3	ns	ns	ns	-30.1	ns	-19.1	48.0	ns	-21.8
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.637	<0.001	nc	nc	nc	nc	nc	nc	-28.8	-26.3	-23.4	ns	ns	ns	-34.9	-15.9	-26.6	29.1	ns	-12.7
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.069	0.086	-22.4	-12.9	ns	12.3	21.4	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Beryllium (Be)	Fraction 3	mg/kg	lognormal	<0.001	0.010	<0.001	nc	nc	nc	nc	nc	nc	-37.7	-34.9	-33.1	ns	ns	ns	-48.2	-24.1	-43.1	46.5	ns	-25.0
Berymani (Be)	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.005	nc	nc	nc	nc	nc	nc	-31.6	ns	-26.8	33.9	ns	-20.0	-35.3	ns	-41.9	31.2	ns	-31.6
	Fraction 1	mg/kg	lognormal	<0.001	0.053	<0.001	nc	nc	nc	nc	nc	nc	-56.8	ns	-57.8	ns	ns	ns	ns	ns	-81.8	ns	ns	-73.5
	Fraction 2	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-27.4	-71.6	-57.2	-60.9	-41.0	51.0	-53.7	-70.9	-62.5	-37.3	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	-58.3	-56.8	-50.5	-48.8	ns	80.5	-50.6	-59.1	-72.7	-77.3	ns
Cadmium (Cd)	Fraction 4	mg/kg	lognormal	<0.001	0.204	<0.001	nc	nc	nc	nc	nc	nc	-41.0	-60.5	-54.5	-33.1	ns	ns	ns	-60.1	-55.5	-66.9	-63.0	ns
Cadmium (Cd)	Fraction 5	mg/kg	lognormal	0.003	<0.001	0.006	nc	nc	nc	nc	nc	nc	ns	ns	-31.7	ns	ns	ns	-39.5	ns	-30.2	46.6	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-31.6	-61.7	-57.0	-44.0	-37.2	ns	-66.4	-57.5	-66.0	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	-29.9	-58.1	-55.1	-40.3	-36.0	ns	ns	-54.1	-63.4	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	-64.6	-57.0	-55.2	-45.6	ns	ns	-60.3	-60.6	-66.2	-66.5	ns
	Fraction 1	mg/kg	lognormal	0.293	0.053	0.003	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-30.0	ns
	Fraction 2	mg/kg	lognormal	<0.001	0.002	0.015	nc	nc	nc	nc	nc	nc	ns	-91.3	38.9	-91.3	39.9	1,501	58.8	-91.5	84.6	-94.7	ns	2,074
	Fraction 3	mg/kg	lognormal	<0.001	0.036	0.017	nc	nc	nc	nc	nc	nc	259	-65.3	ns	-90.3	ns	294	608	-64.0	ns	-94.9	-70.4	483
Coloium (Ca)	Fraction 4	mg/kg	lognormal	<0.001	0.003	<0.001	nc	nc	nc	nc	nc	nc	37.3	-36.3	ns	-53.6	-26.3	59.0	82.4	-33.5	ns	-63.5	-38.1	69.8
Calcium (Ca)	Fraction 5	mg/kg	lognormal	<0.001	0.095	<0.001	nc	nc	nc	nc	nc	nc	622	797	491	ns	ns	ns	201	491	374	96.0	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.005	0.218	70.0	-79.5	42.8	-87.9	ns	596	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.008	0.200	71.3	-78.0	43.6	-87.2	ns	553	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.011	0.111	74.3	-88.2	47.6	-93.2	ns	1,152	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	- 3 C. 2 GIIG O	9/119	.59511161	3.001	0.011	<b></b>	. 1.0	JU.2	.7.0	U.J.L	.10	., 102		.10		.10				.10	.10			110

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first). Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. If the concentrations in one or more fractions was <LRL, the fraction sum was the sum of the LRL values. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} *100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

^c The MOD was calculated as[EMM_{station 2}- EMM_{station 1}/EMM_{station 1} 100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

														Are	ea Magnitud	le of Differe	nce							
		ANOVA	Model ^a						Area Eff	fects ^b								Area Effec	ts by Year ^c	:				
															20	)19					20	)20		
Constituent	Fraction	Unite	Assumed	Aron	Voor	Aroa:Voar	RG_GHP	RG_GHP	RG_GHP I				RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT	RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year	vs RG_GHBP	vs RG_GAUT	vs RG_GANF	vs RG_GAUT	vs RG_GANF	vs RG_GANF	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs	vs
														RG_GAUT			RG_GANE	RG_GANF		RG_GAUT				
	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	-40.7	-22.5	-28.3	30.7	ns	ns	-52.3	ns	-32.1	74.3	42.2	-18.4
Chromium (Cr)	Fraction 4	mg/kg	lognormal	0.061	0.126	0.013	nc	nc	nc	nc	nc	nc	ns	-31.9	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.011	0.216	-18.3	ns	-18.7	20.2	ns	-17.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 1	mg/kg	lognormal	0.776	<0.001	0.012	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.046	0.025	<0.001	nc	nc	nc	nc	nc	nc	-60.7	ns	-60.7	131	ns	-56.8	ns	ns	ns	ns	-46.5	ns
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-29.8	50.2	ns	114	ns	-41.5	-65.2	33.5	-40.7	284	70.5	-55.5
Cobalt (Co)	Fraction 4	mg/kg	lognormal	<0.001	0.263	<0.001	nc	nc	nc	nc	nc	nc	43.8	ns	ns oo 4	ns	-34.5	ns	71.3	ns	ns	-27.0	-52.4	-34.9
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-41.7	ns 28.8	-28.4 -26.0	58.2	ns	-22.3	-47.8 -27.0	ns 37.1	-33.0 -30.2	81.6 87.9	ns	-29.3
	Sum of 1 to 4 Sum of 1 to 5	mg/kg	lognormal	<0.001	0.013	<0.001	nc	nc	nc	nc	nc	nc	ns		-28.8	ns	ns	-42.5 -37.8	-32.9	24.8	-30.2	86.0	ns	-49.1 -44.1
		mg/kg	lognormal	<0.001		<0.001	nc	nc	nc	nc	nc	nc	ns 25.0	ns 38.5	-20.9	ns 116	ns 23.2		-52.9	28.6	-37.8	169	ns 30.5	
	Sum of 2 and 3 Fraction 4	mg/kg mg/kg	lognormal	<0.001	<0.001	<0.001	nc nc	nc	nc nc	nc	nc nc	nc nc	-35.8 -39.4	-73.1	-60.8	-55.6	-35.3	-42.9 ns	-32.3 ns	-60.9	-60.6	-57.7	-57.4	-51.6 ns
Copper (Cu)	Fraction 5	mg/kg	lognormal lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	-51.5	-35.5	-43.0	33.0	ns	ns	-52.7	-30.1	-49.0	47.8	ns	-27.1
	Fraction 3	mg/kg	lognormal	<0.001	0.298	<0.001	nc	nc	nc	nc	nc	nc	-49.3	ns	ns	113	64.2	-23.0	-53.3	ns	-22.0	173	67.1	-38.8
Iron (Fe)	Fraction 4	mg/kg	lognormal	0.013	0.779	0.036	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
11 (11 0)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.018	nc	nc	nc	nc	nc	nc	ns	39.5	ns	70.1	ns	ns	-33.6	38.6	ns	109	ns	-37.3
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	0.007	nc	nc	nc	nc	nc	nc	-32.2	-26.9	-32.0	ns	ns	ns	-20.7	-26.1	-25.6	ns	ns	ns
Lead (Pb)	Fraction 4	mg/kg	lognormal	<0.001	0.124	<0.001	nc	nc	nc	nc	nc	nc	-61.4	-53.1	ns	ns	ns	ns	ns	ns	-48.8	ns	ns	ns
(	Fraction 5	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	-40.5	ns	ns	56.5	ns	ns	-55.2	ns	-42.5	100	ns	-35.8
Lithium (Li)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	65.7	29.1	61.2	25.6	-22.1	ns	82.7	ns	94.1	ns	-40.6
( )	Fraction 1	mg/kg	lognormal	0.493	<0.001	0.007	nc	nc	nc	nc	nc	nc	-75.9	-81.4	ns	ns	ns	ns	359	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.190	<0.001	0.188	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 3	mg/kg	lognormal	<0.001	0.012	0.005	nc	nc	nc	nc	nc	nc	85.0	130	108	ns	ns	ns	ns	127	ns	234	ns	-59.3
	Fraction 4	mg/kg	lognormal	<0.001	0.019	0.038	nc	nc	nc	nc	nc	nc	ns	110	ns	84.7	ns	ns	ns	99.9	ns	186	ns	-58.7
Manganese (Mn)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.002	nc	nc	nc	nc	nc	nc	-29.6	ns	ns	69.7	ns	-30.8	-44.0	ns	ns	125	ns	-40.3
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.036	0.781	24.4	49.6	ns	ns	ns	-22.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.025	0.718	ns	44.7	ns	ns	ns	-23.0	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.065	0.178	ns	58.8	ns	ns	ns	-27.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Molybdenum (Mo)	Fraction 5	mg/kg	lognormal	<0.001	0.294	0.010	nc	nc	nc	nc	nc	nc	-30.1	ns	-37.7	ns	ns	ns	-48.4	ns	-45.2	50.8	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.180	<0.001	nc	nc	nc	nc	nc	nc	ns	-36.4	-57.9	-50.1	-67.0	-33.7	166	ns	-61.5	-73.3	-85.5	-45.8
	Fraction 2	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	46.0	-46.7	-65.5	-63.5	-76.4	-35.3	164	-52.7	-63.8	-82.1	-86.3	-23.3
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	33.8	-20.7	-51.5	-40.7	-63.8	-38.9	67.0	-31.1	-64.3	-58.7	-78.6	-48.1
	Fraction 4	mg/kg	lognormal	<0.001	0.104	<0.001	nc	nc	nc	nc	nc	nc	106	ns	ns	-61.6	-64.9	ns	329	ns	-35.9	-81.9	-85.0	ns
Nickel (Ni)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.004	nc	nc	nc	nc	nc	nc	-40.5	ns	-34.5	41.3	ns	ns	-44.8	ns	-40.3	56.1	ns	-30.6
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.009	<0.001	nc	nc	nc	nc	nc	nc	53.5	-26.1	-51.5	-51.8	-68.4	-34.3	144	-33.0	-59.6	-72.6	-83.5	-39.7
	Sum of 1 to 5	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	28.0	-23.3	-47.0	-40.1	-58.6	-31.0	90.7	-27.7	-54.5	-62.1	-76.2	-37.1
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	36.8	-27.4	-55.1	-46.9	-67.2	-38.2	89.3	-36.3	-64.2	-66.4	-81.1	-43.8
	Sam of Z and O	mg/ng	logiloilliai	-0.001	10.001	10.001	110	110	110	110	110	110	00.0	£1. <del>1</del>	00.1	+0.0	01.2	00.2	00.0	00.0	07.2	UU. <del>T</del>	01.1	70.0

P-value <0.

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} *100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

The MOD was calculated as[EMM_{station 2}- EMM_{station 1}/EMM_{station 1}]/EMM_{station 1}/EMM_{station 1} *100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

														Are	ea Magnitud	le of Differe	nce							
		ANOVA	Model ^a						Area E	ffects ^b								Area Effec	ts by Year ^c	:				
															20	19					20	)20		
Constituent	Fraction	Unito	Assumed	A #0.0	Voor	AroniVoor	RG_GHP	RG_GHP			RG_GHBP		RG_GHF	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT	RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year	vs RG_GHBP	vs RG_GAUT	vs RG_GANF	vs RG_GAUT	vs RG_GANF	vs RG_GANF	vs	vs P RG_GAUT	vs	vs RG_GAUT	vs RG_GANF	vs RG_GANF	vs RG_GHBP	vs RG_GAUT	vs	vs	vs	vs
Phosphorus (P)	Fraction 3	mg/kg	lognormal	<0.001	0.182	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	-54.7	ns	ns	-56.7
	Fraction 1	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Potassium (K)	Sum of 1 to 4	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.510	0.028	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Salanium (Sa)	Fraction 3	mg/kg	lognormal	<0.001	0.392	<0.001	nc	nc	nc	nc	nc	nc	165	-81.6	-99.4	-93.0	-99.8	-96.8	314	-99.8	-81.5	-100.0	-95.5	8,285
Selenium (Se)	Fraction 4	mg/kg	lognormal	<0.001	0.120	<0.001	nc	nc	nc	nc	nc	nc	ns	-92.7	-90.4	-91.2	-88.5	ns	96.4	-91.6	-88.5	-95.7	-94.1	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.011	<0.001	nc	nc	nc	nc	nc	nc	-60.4	-88.6	-88.3	-71.3	-70.6	ns	ns	-84.8	-87.1	-83.6	-86.1	ns
Silver (Ag)	Fraction 5	mg/kg	lognormal	<0.001	0.979	<0.001	nc	nc	nc	nc	nc	nc	-57.5	-69.2	-55.2	ns	ns	ns	-48.0	-60.0	-56.1	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.001	0.210	ns	189	42.0	159	27.2	-50.9	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 2	mg/kg	lognormal	<0.001	0.007	0.002	nc	nc	nc	nc	nc	nc	ns	-62.4	58.2	-57.6	78.5	321	ns	-52.1	102	-63.1	55.2	321
	Fraction 3	mg/kg	lognormal	<0.001	0.025	0.022	nc	nc	nc	nc	nc	nc	ns	ns	ns	-62.0	ns	ns	187	ns	ns	-72.0	ns	ns
Strontium (Sr)	Fraction 4	mg/kg	lognormal	0.049	0.021	0.005	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Strontium (Sr)	Fraction 5	mg/kg	lognormal	<0.001	0.035	0.031	nc	nc	nc	nc	nc	nc	ns	-24.6	-34.0	ns	ns	ns	-38.9	-28.8	-36.0	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.004	0.043	nc	nc	nc	nc	nc	nc	ns	ns	ns	-35.7	ns	68.8	60.1	ns	65.4	-35.0	ns	58.8
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.033	0.013	nc	nc	nc	nc	nc	nc	ns	-21.9	ns	-33.4	ns	34.6	ns	ns	ns	-22.3	ns	32.7
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.016	0.024	nc	nc	nc	nc	nc	nc	ns	-52.5	ns	-62.7	ns	206	88.0	-41.2	88.7	-68.7	ns	221
Thallium (TI)	Fraction 5	mg/kg	lognormal	0.007	0.030	0.059	ns	ns	-12.8	ns	-16.9	-12.7	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Titanium (Sn)	Fraction 4	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Transan (en)	Fraction 5	mg/kg	lognormal	<0.001	0.015	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	97.6	ns	146	37.8	-43.9
	Fraction 1	mg/kg	lognormal	<0.001	0.020	0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	<0.001	0.021	<0.001	nc	nc	nc	nc	nc	nc	ns	-82.9	-44.5	-86.3	-55.5	225	211	ns	ns	ns	-74.2	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.034	<0.001	nc	nc	nc	nc	nc	nc	97.9	-50.0	-41.2	-74.8	-70.3	ns	160	-54.1	-41.3	-82.3	-77.5	ns
Uranium (U)	Fraction 4	mg/kg	lognormal	<0.001	0.135	<0.001	nc	nc	nc	nc	nc	nc	ns	-45.6	-36.7	ns	ns	ns	ns	-42.6	-37.2	-41.9	-36.4	ns
(0)	Fraction 5	mg/kg	lognormal	<0.001	0.172	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-27.6	ns	ns	-21.9	-43.2	ns	-38.7	38.0	ns	-21.8
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.062	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	89.8	ns	ns	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.074	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.024	<0.001	nc	nc	nc	nc	nc	nc	ns	-72.6	-44.3	-82.8	-65.2	103	181	ns	ns	ns	-76.0	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	-55.5	-26.3	-48.5	65.8	ns	-30.1	-63.5	-23.5	-51.0	109	34.2	-35.9
Vanadium (V)	Fraction 4	mg/kg	lognormal	<0.001	0.067	0.004	nc	nc	nc	nc	nc	nc	-33.5	-33.9	-36.0	ns	ns	ns	ns	ns	-39.1	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.368	-31.3	ns	-28.3	31.4	ns	-20.6	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 2	mg/kg	lognormal	<0.001	0.003	<0.001	nc	nc	nc	nc	nc	nc	ns	-55.4	-61.0	-61.9	-66.6	ns	83.6	-52.8	-60.8	-74.3	-78.7	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	ns	-47.0	-54.9	-44.4	-52.7	ns	82.9	-40.3	-54.4	-67.3	-75.1	-23.7
Zinc (Zn)	Fraction 4	mg/kg	lognormal	<0.001	0.006	<0.001	nc	nc	nc	nc	nc	nc	-37.7	-51.4	-48.8	ns	ns	ns	ns	-46.8	-54.5	-56.5	-62.7	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	nc	nc	nc	nc	nc	nc	-41.0	ns	-26.6	54.8	ns	ns	-41.6	ns	-33.0	48.1	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	-49.5	-56.8	-49.1	-56.4	ns	82.6	-43.5	-56.1	-69.1	-76.0	-22.3

P-value < 0.0

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. If the concentrations in one or more fractions was <LRL, the fraction sum was the sum of the LRL values. Constituents that had >75% censored data were excluded from the analyses.

b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} *100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

The MOD was calculated as[EMM_{station 2}- EMM_{station 1}/EMM_{station 1}]/EMM_{station 1}/100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

											Are	ea Magnitud	le of Differe	nce				
		ANOVA	Model ^a									Area Effec	ts by Year ^c					
									20	)21					20	22		
Constituent	Fraction	Units	Assumed Distribution	Area	Year	Area:Year	vs	RG_GHP vs	RG_GHP vs	vs	vs	vs	RG_GHP vs	RG_GHP vs	vs	vs	RG_GHBP	vs
								RG_GAUT		RG_GAUT				RG_GAUT	RG_GANF			
	Fraction 3	mg/kg	lognormal	<0.001	0.568	<0.001	-57.5	ns	-36.8	147	48.6	-39.9	-29.3	ns	ns	61.3	30.7	-19.0
Aluminum (Al)	Fraction 4	mg/kg	lognormal	<0.001	0.071	<0.001	-63.8	ns	ns	244	158	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.131	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Antimony (Sb)	Fraction 5	mg/kg	lognormal	<0.001	0.310	<0.001	-56.9	ns	ns	186	118	-23.8	-24.1	ns	-24.4	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.133	0.004	<0.001	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.121	0.127	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Arsenic (As)	Fraction 4	mg/kg	lognormal	0.665	0.066	0.029	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	-28.9	ns	-27.0	43.9	ns	-28.7	ns	ns	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	0.003	0.014	0.008	ns	ns	ns	ns	ns	ns	-51.3	ns	-39.7	82.1	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.001	<0.001	ns	179	ns	122	ns	-50.6	-33.2	171	ns	306	78.7	-56.0
	Fraction 2	mg/kg	lognormal	<0.001	0.001	<0.001	-14.2	-27.2	ns	-15.2	24.7	47.0	-32.1	-37.9	ns	ns	38.0	51.0
	Fraction 3	mg/kg	lognormal	0.003	0.596	0.080	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
IDavissa (Da)	Fraction 4	mg/kg	lognormal	0.002	0.012	<0.001	-61.3	ns	ns	128	101	ns	ns	ns	ns	ns	ns	ns
Barium (Ba)	Fraction 5	mg/kg	lognormal	<0.001	0.500	0.105	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.042	0.002	-19.7	ns	ns	46.1	32.3	ns	-19.2	ns	ns	36.8	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.637	<0.001	-30.2	ns	-12.6	40.3	25.2	ns	-17.1	ns	-15.2	16.2	ns	-11.9
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.069	0.086	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Domillium (Do)	Fraction 3	mg/kg	lognormal	<0.001	0.010	<0.001	ns	ns	-21.3	ns	ns	ns	-21.7	ns	ns	21.9	ns	ns
Beryllium (Be)	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.005	-36.1	ns	-26.8	41.4	ns	-18.9	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.053	<0.001	ns	ns	-71.4	ns	ns	-69.4	ns	88.5	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	<0.001	<0.001	<0.001	-37.6	-67.4	-59.2	-47.8	-34.7	ns	ns	-63.2	-47.8	-68.6	-55.4	42.0
	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	347	ns	-32.0	-83.1	-84.8	ns	ns	ns	-39.0	-33.2	-47.6	ns
10 1 : (0.1)	Fraction 4	mg/kg	lognormal	<0.001	0.204	<0.001	ns	ns	-31.7	-49.1	-50.9	ns	ns	ns	-33.8	ns	ns	ns
Cadmium (Cd)	Fraction 5	mg/kg	lognormal	0.003	<0.001	0.006	ns	ns	-28.9	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	<0.001	<0.001	-100.0	-41.5	-50.5	,440,023,77	,985,494,34	ns	ns	-28.4	-35.8	-39.9	-46.1	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.001	<0.001	ns	-38.7	-49.0	ns	ns	ns	ns	-27.3	-34.3	-38.4	-44.3	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	154	-47.2	-46.4	-79.2	-78.9	ns	ns	-42.3	-44.3	-49.9	-51.6	ns
	Fraction 1	mg/kg	lognormal	0.293	0.053	0.003	ns	ns	ns	43.7	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	<0.001	0.002	0.015	ns	-93.7	ns	-94.3	ns	1,759	ns	-92.7	ns	-93.0	ns	1,414
	Fraction 3	mg/kg	lognormal	<0.001	0.036	0.017	647	ns	423	-94.8	ns	1,246	ns	-77.2	ns	-82.7	ns	406
	Fraction 4	mg/kg	lognormal	<0.001	0.003	<0.001	61.0	ns	87.1	-46.3	ns	117	ns	-30.5	ns	-43.0	ns	47.1
Calcium (Ca)	Fraction 5	mg/kg	lognormal	<0.001	0.095	<0.001	1,077	341	430	-62.6	-55.0	ns	262	182	218	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.005	0.218	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.008	0.200	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.011	0.111	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

^b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1} *100 for all years combined when the Area: Year term was insignificant (α = 0.05) . The EMM is the estimated marginal mean from the censored regression model.

^c The MOD was calculated as[EMM_{station 2}- EMM_{station 1})/EMM_{station 1} *100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

			3								Ar	ea Magnitud	e of Differe	nce				
		ANOVA	Model ^a									Area Effec	ts by Year ^c					
									20	)21					20	22		
Constituent	Fraction	Units	Assumed Distribution	Area	Year	Area:Year	vs	RG_GHP vs	RG_GHP vs	vs	vs	RG_GAUT	vs	RG_GHP vs	vs	vs	RG_GHBP vs	vs
												RG_GANF						
OL : (O.)	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	ns	-25.4	-39.4	-31.6	-44.5	-18.8	-41.8	-24.7	-18.3	29.4	40.4	ns
Chromium (Cr)	Fraction 4	mg/kg	lognormal	0.061	0.126	0.013	-38.3	ns	ns	51.8	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.011	0.216	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 1	mg/kg	lognormal	0.776	<0.001	0.012	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.046	0.025	<0.001	ns	ns	ns	ns	ns	ns	-43.7	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	-74.8	ns	-49.6	377	100	-58.1	-29.5	ns	ns	31.6	ns	ns
Cobalt (Co)	Fraction 4	mg/kg	lognormal	<0.001	0.263	<0.001	ns	57.0	ns	94.9	45.5	ns	53.4	ns	ns	ns	-39.8	ns
` ,	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	-54.1	ns	-32.3	92.7	47.6	-23.4	ns	ns	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.013	<0.001	-56.1	22.5	-32.9	179	52.9	-45.2	-21.4	ns	-19.6	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.001	<0.001	-55.5	ns	-32.7	149	51.2	-39.4	-18.1	ns	-15.5	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	-64.1	ns	-43.0	231	59.0	-51.9	-32.7	-15.7	-21.5	25.3	ns	ns
Copper (Cu)	Fraction 4	mg/kg	lognormal	<0.001	0.011	<0.001	-44.1	-38.9	-34.9	ns	ns	ns	ns	ns	ns	ns	ns	ns
Сорро. (Са)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	-63.8	-32.5	-49.8	86.7	38.9	-25.6	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.298	<0.001	-22.3	ns	-30.4	56.2	ns	-42.7	-33.2	ns	ns	50.2	31.3	ns
Iron (Fe)	Fraction 4	mg/kg	lognormal	0.013	0.779	0.036	ns	62.2	ns	78.8	76.8	ns	60.6	61.0	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.018	-30.1	ns	ns	58.5	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	0.007	-15.0	-29.2	-19.1	-16.8	ns	ns	-23.9	-35.5	-20.4	-15.2	ns	23.4
Lead (Pb)	Fraction 4	mg/kg	lognormal	<0.001	0.124	<0.001	ns	ns	-42.3	ns	ns	-46.2	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.002	<0.001	-63.8	ns	-39.4	154	67.3	-34.0	ns	ns	ns	ns	ns	ns
Lithium (Li)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	47.9	49.2	ns	ns	-22.4	-23.1	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	0.493	<0.001	0.007	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.190	<0.001	0.188	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 3	mg/kg	lognormal	<0.001	0.012	0.005	ns	ns	ns	ns	ns	-54.5	ns	ns	ns	ns	ns	ns
M (M 4 )	Fraction 4	mg/kg	lognormal	<0.001	0.019	0.038	ns	75.9	ns	149	ns	-59.8	ns	80.3	ns	ns	ns	-37.3
Manganese (Mn)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.002	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.036	0.781	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.025	0.718	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.065	0.178	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Molybdenum (Mo)	Fraction 5	mg/kg	lognormal	<0.001	0.294	0.010	ns	ns	-47.9	ns	-40.4	-35.3	ns	ns	ns	ns	ns	ns
· ·	Fraction 1	mg/kg	lognormal	<0.001	0.180	<0.001	-45.9	-65.7	-77.8	-36.6	-58.9	-35.1	ns	ns	-77.2	ns	-81.7	ns
	Fraction 2	mg/kg	lognormal	<0.001	<0.001	<0.001	-48.3	-75.1	-77.5	-51.8	-56.5	ns	ns	ns	-84.3	ns	-83.2	ns
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	-67.9	-50.4	-73.8	54.4	-18.6	-47.2	ns	-64.8	-67.2	-69.2	-71.4	ns
	Fraction 4		lognormal	<0.001	0.104	<0.001	-40.7	ns		ns	ns	ns	133	-31.1	-43.0	-70.4	-71.4	ns
Nickel (Ni)	Fraction 5	mg/kg	•	<0.001					ns 27.5									
		mg/kg	lognormal		<0.001	0.004	-46.1	ns	-37.5	59.5	ns	-27.3	ns	ns	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.009	<0.001	-57.7	-48.8	-66.8	ns	ns	-35.2	32.5	ns	-69.6	ns	-77.1	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	<0.001	<0.001	-55.2	-41.0	-61.2	31.5	ns	-34.3	25.8	ns	-60.7	ns	-68.8	ns
<u> </u>	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	-62.8	-56.8	-74.8	ns	-32.3	-41.6	ns	ns	-73.9	ns	-76.0	ns

P-value <0.0

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first).

Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area:Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. If the concentrations in one or more fractions was <LRL, the fraction sum was the sum of the LRL values. Constituents that had >75% censored data were excluded from the analyses.

b The MOD was calculated as [EMM_{station 2}* EMM_{station 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05) . The EMM is the estimated marginal mean from the censored regression model.

c The MOD was calculated as[EMM_{station 1}/- EMM_{station 1}]/EMM_{station 1} *100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.21: Differences in Concentrations of Sediment Quality Constituents Among Sampling Areas on Lower Greenhills and Gardine Creeks, Based on Sequential Extraction Analysis, 2019 to 2022

I											Are	ea Magnitud	le of Differe	nce				
		ANOVA	Model ^a									Area Effec	ts by Year ^c	:				
									20	)21					20	)22		
Constituent	Fraction	Units	Assumed	Area	Year	Area:Year	RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT	RG_GHP	RG_GHP	RG_GHP	RG_GHBP	RG_GHBP	RG_GAUT
Constituent	Fraction	Offics	Distribution	Alea	rear		vs	VS PG GALIT	VS PG GANE	VS PG GALIT	VS PG GANE	VS PG GANE	VS PG GURD	VS PG GALIT	VS PG GANE	VS PG GALIT	VS PG GANE	vs RG_GANF
Phosphorus (P)	Fraction 3	mg/kg	lognormal	<0.001	0.182	<0.001	-38.8	ns	-52.3	ns	ns	-48.3	ns	83.0	ns	ns	ns	-41.9
	Fraction 1	mg/kg	lognormal	0.987	<0.001	<0.001	ns	50.4	56.6	50.4	56.6	ns	ns	ns	ns	ns	ns	ns
Potassium (K)	Sum of 1 to 4	mg/kg	lognormal	0.987	<0.001	<0.001	ns	50.4	56.6	50.4	56.6	ns	ns	ns	ns	ns	ns	ns
` <i>` ,</i>	Sum of 1 to 5	mg/kg	lognormal	0.987	<0.001	<0.001	ns	50.4	56.6	50.4	56.6	ns	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.510	0.028	-81.4	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
1	Fraction 3	mg/kg	lognormal	<0.001	0.392	<0.001	ns	-85.0	-73.7	-77.0	-59.6	ns	ns	-99.9	-99.8	-99.9	-99.8	ns
Selenium (Se)	Fraction 4	mg/kg	lognormal	<0.001	0.120	<0.001	-73.7	-91.1	-84.8	-66.2	ns	ns	ns	-94.0	-93.6	-90.3	-89.6	ns
I	Fraction 5	mg/kg	lognormal	<0.001	0.011	<0.001	-85.3	-87.4	-86.7	ns	ns	ns	-61.6	-91.6	-91.7	-78.2	-78.3	ns
Silver (Ag)	Fraction 5	mg/kg	lognormal	<0.001	0.979	<0.001	-69.2	ns	ns	121	141	ns	-35.5	-34.6	-41.8	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.001	0.210	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
1	Fraction 2	mg/kg	lognormal	<0.001	0.007	0.002	ns	-66.6	52.6	-74.8	ns	357	ns	-75.9	ns	-69.2	ns	343
1	Fraction 3	mg/kg	lognormal	<0.001	0.025	0.022	342	ns	190	-81.0	ns	244	ns	ns	ns	ns	ns	ns
1	Fraction 4	mg/kg	lognormal	0.049	0.021	0.005	-20.3	ns	25.0	41.0	56.9	ns	ns	ns	ns	ns	ns	ns
Strontium (Sr)	Fraction 5	mg/kg	lognormal	<0.001	0.035	0.031	ns	ns	-26.8	ns	ns	ns	ns	ns	ns	ns	ns	ns
I	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.004	0.043	96.6	ns	85.5	-49.4	ns	86.6	ns	-32.7	ns	ns	ns	55.3
I	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.033	0.013	54.2	ns	43.7	-38.2	ns	50.6	ns	-27.8	ns	ns	ns	35.1
I	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.016	0.024	128	-52.9	94.7	-79.3	ns	313	ns	-65.9	ns	-60.3	ns	205
	Fraction 5	mg/kg	lognormal	0.007	0.030	0.059	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
. ,	Fraction 4	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-85.7	209	-89.0	ns	2,066	587	ns	379	-84.6	ns	353
Titanium (Sn)	Fraction 5	mg/kg	lognormal	<0.001	0.015	<0.001	109	44.1	ns	-31.2	-51.2	-29.1	ns	50.8	ns	82.0	ns	-32.1
 [	Fraction 1	mg/kg	lognormal	<0.001	0.020	0.001	ns	ns	-67.3	ns	ns	ns	-70.3	ns	ns	ns	ns	ns
1	Fraction 2	mg/kg	lognormal	<0.001	0.021	<0.001	ns	-81.2	ns	-71.1	ns	237	ns	-87.2	-65.5	-83.5	-55.5	170
1	Fraction 3	mg/kg	lognormal	<0.001	0.034	<0.001	ns	-36.5	ns	-44.9	ns	57.5	ns	-46.8	-48.9	-58.7	-60.4	ns
L	Fraction 4	mg/kg	lognormal	<0.001	0.135	<0.001	-57.6	ns	-33.7	101	56.2	ns	ns	ns	ns	ns	-35.2	ns
Uranium (U)	Fraction 5	mg/kg	lognormal	<0.001	0.172	<0.001	ns	ns	-33.1	-23.8	-39.9	ns	ns	ns	ns	ns	ns	ns
1	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.062	<0.001	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
I	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.074	<0.001	ns	ns	-39.7	ns	ns	ns	ns	ns	ns	ns	ns	ns
I	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.024	<0.001	ns	-63.9	ns	-58.2	ns	118	ns	-70.5	-58.4	-70.4	-58.3	ns
 [	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	-17.2	-26.6	-49.8	ns	-39.3	-31.6	-46.1	-27.4	-30.2	34.6	29.4	ns
Vanadium (V)	Fraction 4	mg/kg	lognormal	<0.001	0.067	0.004	-51.3	ns	-29.7	65.1	44.5	ns	ns	ns	ns	ns	ns	ns
` '	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.368	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 2	mg/kg	lognormal	<0.001	0.003	<0.001	61.8	-62.0	-61.9	-76.5	-76.4	ns	ns	-75.2	-74.7	-77.3	-76.8	ns
I	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	57.7	-36.1	-48.7	-59.5	-67.5	ns	ns	-52.3	-48.1	-58.1	-54.3	ns
Zinc (Zn)	Fraction 4	mg/kg	lognormal	<0.001	0.006	<0.001	ns	ns	-34.9	ns	ns	-33.6	ns	ns	ns	ns	ns	ns
, <i>,</i>	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	-45.8	ns	-34.3	54.5	ns	ns	ns	ns	ns	ns	ns	ns
I	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.002	<0.001	59.2	-43.0	-52.3	-64.2	-70.0	ns	ns	-58.6	-55.2	-63.0	-60.0	ns

Positive MOD (higher concentration of constituent at second biological monitoring area relative to the first). Negative MOD (lower concentration of constituent at second biological monitoring area relative to the first).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

b The MOD was calculated as [EMM_{station 2}- EMM_{station 1}]/EMM_{station 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

c The MOD was calculated as[EMM_{station 1}/EMM_{station 1}]/EMM_{station 1} *100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.22: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, 2019 to 2022

		101/4 **	-1-18											Year	ly Magnitu	de of Differ	ence							
	AN	IOVA Mod	aeı "						Year E	ffects ^b								Year Effec	ts by Area	c				
			Assumed				2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs			RG_	GHP					RG_C	SHBP		
	Constituent	Units	Distribution	Area	Year	Area:Year	2020	2021	2022	2021	2022	2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022
	Moisture	%	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	31.5	ns	ns	ns	-25.0	ns	-35.0	-37.4
	pH (1:2 soil:water)	pH units	lognormal	0.848	<0.001	<0.001	nc	nc	nc	nc	nc	nc	nc	3.72	ns	nc	nc	-2.49	nc	7.88	10.8	nc	nc	2.67
	Silt (0.0312 mm to 0.004 mm)	%	lognormal	<0.001	0.053	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Silt (0.063 mm to 0.0312 mm)	%	lognormal	0.001	0.900	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	72.7	ns	-47.6	-45.8						
	Clay (<4 µm)	%	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-33.8	ns	-29.9	ns	60.3	ns	88.8	-33.4	ns	76.8
Physical Tests	Sand (0.125 mm to 0.063 mm)	%	lognormal	<0.001	0.781	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	200	ns	167	144	ns	ns	ns	ns	ns	ns
	Sand (0.25 mm to 0.125 mm)	%	lognormal	<0.001	0.902	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	126	ns
	Sand (0.50 mm to 0.25 mm)	%	lognormal	<0.001	0.710	0.020	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	145	ns
	Sand (1.00 mm to 0.50 mm)	%	lognormal	<0.001	0.413	0.578	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sand (2.00 mm to 1.00 mm)	%	lognormal	<0.001	0.140	0.366	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Gravel (>2 mm)	%	lognormal	<0.001	0.565	0.708	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Organic Carbon	Total Organic Carbon	%	lognormal	<0.001	0.004	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Aluminum (AI)	mg/kg	lognormal	<0.001	<0.001	0.083	ns	-22.6	ns	-31.4	-24.8	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Antimony (Sb)	mg/kg	lognormal	<0.001	0.010	0.008	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Arsenic (As)	mg/kg	lognormal	<0.001	0.005	0.200	ns	-22.2	ns	ns	ns	21.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Barium (Ba)	mg/kg	lognormal	<0.001	<0.001	0.018	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	-19.5	-21.1	ns	ns	ns
	Beryllium (Be)	mg/kg	lognormal	<0.001	0.270	0.187	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Boron (B)	mg/kg	lognormal	0.006	<0.001	0.186	49.5	ns	ns	-41.1	-36.5	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cadmium (Cd)	mg/kg	lognormal	<0.001	0.569	0.010	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	37.0	ns	ns	ns	-26.3	ns
	Calcium (Ca)	mg/kg	lognormal	<0.001	0.655	0.088	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Chromium (Cr)	mg/kg	lognormal	<0.001	<0.001	0.376	ns	-15.6	ns	-23.6	-18.9	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cobalt (Co)	mg/kg	lognormal	<0.001	0.002	0.160	ns	-14.9	-12.7	-11.9	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Copper (Cu)	mg/kg	lognormal	<0.001	0.332	0.040	nc	nc	nc	nc	nc	nc	ns	ns	-25.9	ns								
	Iron (Fe)	mg/kg	lognormal	<0.001	0.032	0.051	ns	-20.6	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Metals	Lead (Pb)	mg/kg	lognormal	<0.001	0.111	0.080	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
state	Lithium (Li)	mg/kg	lognormal	<0.001	0.171	0.009	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	44.0	ns	ns	57.1
	Magnesium (Mg)	mg/kg	lognormal	<0.001	<0.001	0.157	ns	-18.4	-11.9	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Manganese (Mn)	mg/kg	lognormal	0.002	0.465	0.737	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Mercury (Hg)	mg/kg	lognormal	<0.001	<0.001	0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	-32.3	ns	85.5	52.0	ns	ns	-51.1	-40.3
	Molybdenum (Mo)	mg/kg	lognormal	<0.001	0.027	0.186	ns	ns	ns	ns	ns	21.9	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Nickel (Ni)	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	52.3	ns	-26.8	ns	-52.0	-42.5
	Phosphorus (P)	mg/kg	lognormal	0.001	0.007	0.390	ns	-17.0	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Potassium (K)	mg/kg	lognormal	<0.001	<0.001	0.149	23.8	ns	ns	-30.8	-25.4	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Selenium (Se)	mg/kg	lognormal	<0.001	0.603	0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-72.7	-68.1
	Silver (Ag)	mg/kg	lognormal	<0.001	0.626	0.162	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sodium (Na)	mg/kg	lognormal	0.002	<0.001	0.045	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	-30.5	-24.6	ns
	Strontium (Sr)	mg/kg	lognormal	<0.001	0.808	0.216	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sulphur (S)	mg/kg	lognormal	<0.001	0.474	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	97.4	ns	ns	ns	ns	ns	-59.7	ns

P-value <0.

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area:Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{Year 2}- EMM_{Year 1}*100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

 $^{^{\}circ}$  The MOD was calculated as[EMM_{Year 2}- EMM_{Year 1}*100 for each year when the Area:Year term was significant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.22: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, 2019 to 2022

	AN	OVA Mod												i cui	ly Magnitud		01100							
					T	I		T T	Year E	ffects ^b	Т	П						Year Effect	s by Area					
	Constituent	Units	Assumed	Area	Year	Area:Year	2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs	2010 1/2	2019 vs	RG_ 2019 vs	2020 vs	2020 vs	2021 vs	2019 vs	2019 vs	RG_0	3HBP 2020 vs	2020 vs	2024 1/2
	Concentación	Oc	Distribution	71100	1001	7110011001	2020	2021	2022	2021	2022	2022	2019 vs 2020	2019 VS 2021	2019 VS 2022	2020 VS 2021	2020 VS 2022	2021 VS 2022	2019 VS 2020	2019 VS 2021	2019 VS 2022	2020 VS 2021	2020 VS 2022	2021 vs 2022
1	Thallium (TI)	mg/kg	lognormal	<0.001	<0.001	0.081	24.2	ns	ns	-25.8	-22.5	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
1	Tin (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	nc	nc	nc	nc	nc	nc	374	ns	ns	-80.1	-77.8	ns	203	-36.0	ns	-78.8	-64.2	69.4
1	Titanium (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	nc	nc	nc	nc	nc	nc	374	ns	ns	-80.1	-77.8	ns	203	-36.0	ns	-78.8	-64.2	69.4
Metals	Uranium (U)	mg/kg	lognormal	<0.001	0.515	0.003	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-45.8	-37.5
\	Vanadium (V)	mg/kg	lognormal	<0.001	<0.001	0.164	ns	-18.6	ns	-27.0	-18.9	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Z	Zinc (Zn)	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-19.6	ns	ns	ns	52.8	ns	ns	-20.4	-27.6	ns
Z	Zirconium (Zr)	mg/kg	lognormal	0.022	<0.001	0.100	25.6	ns	ns	-25.3	-17.3	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
A	Acenaphthylene	mg/kg	log-normal	0.002	<0.001	0.454	ns	ns	ns	ns	109	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
E	Benz(a)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
E	Benzo(a)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	106	127	260	ns	ns	-57.3	-73.1
E	Benzo(b&j)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	124	ns	ns	ns	122	222	ns	ns	-50.0	-65.5
E	Benzo(b+j+k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	133	ns	ns	ns	124	222	ns	ns	-52.8	-67.2
E	Benzo(e)pyrene	mg/kg	lognormal	<0.001	<0.001	0.003	nc	nc	nc	nc	nc	nc	ns	ns	nc	ns	nc	nc	132	228	nc	ns	nc	nc
E	Benzo(g,h,i)perylene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	135	ns	ns	117	137	268	ns	ns	-51.4	-68.6
E	Benzo(k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	252	ns	128	188	ns	ns	ns	ns	ns	ns
	Chrysene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	97.4	ns	ns	ns	114	ns	ns	ns	ns	ns
	Dibenz(a,h)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	88.4	ns	144	ns	ns	113	ns	ns	ns	ns	ns	-56.2
Hydrocarbons F	Fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	138	201	ns	ns	ns	-59.5
F	Fluorene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	103	ns	ns	ns	177	294	ns	ns	-58.8	-71.1
I	Indeno(1,2,3-c,d)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	147	154	ns	ns	ns	ns	ns
1	1-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	105	ns	ns	ns	146	299	ns	ns	-50.6	-69.5
2	2-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	99.4	ns	ns	ns	147	306	ns	ns	-52.2	-71.0
١	Naphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	123	ns	ns	ns	164	347	ns	ns	-56.2	-74.2
F	Perylene	mg/kg	lognormal	0.019	<0.001	0.364	ns	ns	nc	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
F	Phenanthrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	109	230	ns	ns	ns	-60.9
F	Pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	96.8	ns	ns	ns	108	176	ns	ns	-51.8	-63.7

P-value <0.05.

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area:Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

b The MOD was calculated as [EMM_{Year 2}- EMM_{Year 1}/[EMM_{Year 1}*100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

 $^{^{\}circ}$  The MOD was calculated as[EMM $_{Year~2}^{-}$  EMM $_{Year~1}^{*}$ 100 for each year when the Area:Year term was significant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.22: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, 2019 to 2022

	ANG	N/A M1-1	1								Year	ly Magnitu	de of Differ	ence				
	ANC	OVA Model ⁶	•								,	Year Effect	s by Area '	C				
			A = =						RG_0	GAUT					RG_	GANF		
	Constituent	Units	Assumed Distribution	Area	Year	Area:Year	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022
	Moisture	%	lognormal	<0.001	<0.001	<0.001	ns	36.3	-29.6	38.0	-28.8	-48.4	38.0	78.1	ns	29.0	ns	-36.9
	pH (1:2 soil:water)	pH units	lognormal	0.848	<0.001	<0.001	nc	-8.19	ns	nc	nc	9.19	nc	-5.60	2.72	nc	nc	8.81
	Silt (0.0312 mm to 0.004 mm)	%	lognormal	<0.001	0.053	<0.001	-38.8	ns	75.8	56.4	187	83.8	ns	ns	ns	ns	ns	52.2
	Silt (0.063 mm to 0.0312 mm)	%	lognormal	0.001	0.9	<0.001	-47.9	ns	ns	ns	162	ns						
	Clay (<4 µm)	%	lognormal	<0.001	0.001	<0.001	ns	ns	ns	ns	47.7	ns	ns	ns	144	ns	165	136
Physical Tests	Sand (0.125 mm to 0.063 mm)	%	lognormal	<0.001	0.781	<0.001	ns	ns	ns	ns	ns	ns	96.9	ns	ns	ns	-60.8	ns
	Sand (0.25 mm to 0.125 mm)	%	lognormal	<0.001	0.902	<0.001	ns	ns	-53.4	ns								
	Sand (0.50 mm to 0.25 mm)	%	lognormal	<0.001	0.71	0.02	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sand (1.00 mm to 0.50 mm)	%	lognormal	<0.001	0.413	0.578	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sand (2.00 mm to 1.00 mm)	%	lognormal	<0.001	0.14	0.366	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Gravel (>2 mm)	%	lognormal	<0.001	0.565	0.708	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Organic Carbon	Total Organic Carbon	%	lognormal	<0.001	0.003	<0.001	ns	ns	78.0	ns	115	79.2	ns	ns	82.0	ns	77.6	73.1
	Aluminum (AI)	mg/kg	lognormal	<0.001	<0.001	0.083	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Antimony (Sb)	mg/kg	lognormal	<0.001	0.01	0.008	ns	61.8	ns	51.1	ns	ns	ns	70.7	ns	50.8	ns	ns
	Arsenic (As)	mg/kg	lognormal	<0.001	0.005	0.200	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Barium (Ba)	mg/kg	lognormal	<0.001	<0.001	0.018	ns	ns	ns	ns	ns	34.2	ns	-23.1	-21.8	ns	ns	ns
	Beryllium (Be)	mg/kg	lognormal	<0.001	0.27	0.187	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Boron (B)	mg/kg	lognormal	0.006	<0.001	0.186	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cadmium (Cd)	mg/kg	lognormal	<0.001	0.569	0.01	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Calcium (Ca)	mg/kg	lognormal	<0.001	0.655	0.088	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Chromium (Cr)	mg/kg	lognormal	<0.001	<0.001	0.376	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Cobalt (Co)	mg/kg	lognormal	<0.001	0.002	0.16	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Copper (Cu)	mg/kg	lognormal	<0.001	0.332	0.04	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Iron (Fe)	mg/kg	lognormal	<0.001	0.032	0.051	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Lead (Pb)	mg/kg	lognormal	<0.001	0.111	0.08	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Metals	Lithium (Li)	mg/kg	lognormal	<0.001	0.171	0.009	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Magnesium (Mg)	mg/kg	lognormal	<0.001	<0.001	0.157	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Manganese (Mn)	mg/kg	lognormal	0.002	0.465	0.737	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Mercury (Hg)	mg/kg	lognormal	<0.001	<0.001	0.001	43.2	47.0	44.2	ns	-31.0							
	Molybdenum (Mo)	mg/kg	lognormal	<0.001	0.027	0.186	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Nickel (Ni)	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	-26.2	-38.5	ns	-22.8	ns	ns	-29.7	-27.4	ns	ns	ns
	Phosphorus (P)	mg/kg	lognormal	0.001	0.007	0.390	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Potassium (K)	mg/kg	lognormal	<0.001	<0.001	0.149	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Selenium (Se)	mg/kg	lognormal	<0.001	0.603	0.001	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Silver (Ag)	mg/kg	lognormal	<0.001	0.626	0.162	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sodium (Na)	mg/kg	lognormal	0.002	<0.001	0.045	ns	ns	ns	-22.5	-20.9	ns						
	Strontium (Sr)	mg/kg	lognormal	<0.001	0.808	0.216	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sulphur (S)	mg/kg	lognormal	<0.001	0.474	<0.001	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

P-value <0.0

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

^b The MOD was calculated as [EMM_{Year 1}]/EMM_{Year 1}*100 for all years combined when the Area: Year term was insignificant (α = 0.05) . The EMM is the estimated marginal mean from the censored regression model.

 $^{^{\}circ}$  The MOD was calculated as[EMM_{Year 2}- EMM_{Year 1}]/EMM_{Year 1}*100 for each year when the Area:Year term was significant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.22: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, 2019 to 2022

	ANG	OVA Model	a								Year	ly Magnitu	de of Differ	ence				-
	ANG	JVA WIOGEI	1	<u> </u>	T.							Year Effect	s by Area	c				
	Constituent	Units	Assumed	Area	Year	Area:Year	0040	0040		GAUT	0000	0004	0040	0040	_	GANF	0000	0004
	Constituent	Oilles	Distribution	Aicu	Tour	Alcu. I cui	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022
	Thallium (TI)	mg/kg	lognormal	<0.001	<0.001	0.081	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Tin (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	86.3	ns	ns	-49.5	-49.9	ns	362	75.2	89.6	-62.1	-58.9	ns
	Titanium (Sn)	mg/kg	lognormal	0.031	<0.001	<0.001	86.3	ns	ns	-49.5	-49.9	ns	362	75.2	89.6	-62.1	-58.9	ns
Metals	Uranium (U)	mg/kg	lognormal	<0.001	0.515	0.003	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Vanadium (V)	mg/kg	lognormal	<0.001	<0.001	0.164	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Zinc (Zn)	mg/kg	lognormal	<0.001	0.005	<0.001	ns	-18.0	ns	ns	ns	ns	ns	-22.9	ns	ns	ns	ns
	Zirconium (Zr)	mg/kg	lognormal	0.022	<0.001	0.100	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Acenaphthylene	mg/kg	log-normal	0.002	<0.001	0.454	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Benz(a)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	243	233	ns	ns	121	198	ns	155	ns
	Benzo(a)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	242	314	173	231	ns	ns	ns	ns	ns	184	ns
	Benzo(b&j)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	364	369	148	150	ns	ns	ns	119	ns	ns	ns
	Benzo(b+j+k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	353	343	153	147	ns	ns	ns	150	ns	114	ns
	Benzo(e)pyrene	mg/kg	lognormal	<0.001	<0.001	0.003	ns	335	nc	143	nc	nc	ns	ns	nc	ns	nc	nc
	Benzo(g,h,i)perylene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	364	362	162	161	ns	ns	208	185	ns	ns	ns
	Benzo(k)fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	120	309	ns	ns	ns	780	ns	640	355
	Chrysene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	356	377	227	242	ns	ns	151	211	ns	121	ns
Polycyclic Aromatic Hydrocarbons	Dibenz(a,h)anthracene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	142	133	ns	ns	135	242	ns	113	ns
	Fluoranthene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	358	283	184	137	ns	ns	216	294	ns	137	ns
	Fluorene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	332	415	168	220	ns	ns	171	309	113	222	ns
	Indeno(1,2,3-c,d)pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	ns	ns	ns	179	ns	ns	ns	285	ns	139	ns
	1-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	299	442	139	225	ns	ns	162	330	ns	230	ns
	2-Methylnaphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	311	483	138	238	ns	ns	174	337	ns	225	ns
	Naphthalene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	329	613	121	267	ns	ns	195	467	ns	290	ns
	Perylene	mg/kg	lognormal	0.019	<0.001	0.364	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Phenanthrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	324	393	140	179	ns	ns	180	273	105	173	ns
	Pyrene	mg/kg	lognormal	<0.001	<0.001	<0.001	ns	280	224	144	108	ns	ns	224	229	ns	ns	ns

P-value <0.05.

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area:Year. Post-hoc contrasts were corrected using a Tukey's HSD Test. Constituents that had >75% censored data were excluded from the analyses.

b The MOD was calculated as [EMM_{Year 2}- EMM_{Year 1}/[EMM_{Year 1}*100 for all years combined when the Area: Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

 $^{^{\}circ}$  The MOD was calculated as[EMM $_{Year~2}^{-}$  EMM $_{Year~1}^{*}$ 100 for each year when the Area:Year term was significant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.23: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, Based on Sequential Extraction Analysis, 2019 to 2022

																			١	early l	Magnitu	ide of D	ifferen	ce												
		ANOVA	Model ^a						Year E	ffects ^b													Yea	ar Effec	s by Aı	rea ^c										
			Assumed				2019	2019	2019	2020	2020	2021			RG_	GHP					RG_	GHBP					RG_	GAUT					RG_C	GANF		
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year	vs 2020	vs 2021	vs 2022	vs 2021	vs 2022	vs 2022	2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs	2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs	2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs	2019 vs	2019 vs	2019 vs	2020 vs	2020 vs	2021 vs
	F " 0			:0.004	0.500	-0.004							2020	2021	2022	2021	2022	2022	2020	2021	2022		2022		2020	2021	2022	2021	_	2022	2020	2021	2022	2021	2022	2022
Aluminum (AI)	Fraction 3	mg/kg	lognormal	<0.001	0.568	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	-16.9	ns	ns	22.2 73.1	ns -56.5	44.0	38.2	ns	ns	ns	ns	ns	ns	ns	-17.9	ns	ns	ns	21.5
Aluminum (Al)	Fraction 4 Fraction 5	mg/kg mg/kg	lognormal lognormal	<0.001	<0.071	0.131	nc ns	nc -11.8	nc ns	nc -18.4	nc -14.8	nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	nc	-30.3	ns nc	162 nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc	ns nc
Antimony (Sb)	Fraction 5	mg/kg	lognormal	<0.001	0.310	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-19.4	ns	ns	ns	ns	-35.1	ns	-31.8	ns	59.7	51.6	83.7	ns	ns	-25.6	-38.6	ns	58.4	ns	67.9		-27.1
Antimony (OD)	Fraction 2	mg/kg	lognormal	0.133	0.004	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	196	ns	ns	ns	-56.9	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.121	0.127	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Arsenic (As)	Fraction 4	mg/kg	lognormal	0.665	0.066	0.029	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	-48.1	ns	ns	ns	ns	67.7	ns	ns	ns	ns	ns	ns	ns	ns	ns
` ′	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-27.5	ns	ns	ns	44.1	ns	ns	ns	ns	-26.3	ns	ns	ns	-25.9	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	0.003	0.014	0.008	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-38.8	87.2	ns	206	60.1	-47.7	39.9	51.0	44.7	ns	ns	ns	ns	43.7	ns	ns	ns	ns
	Fraction 2	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	-12.5	ns	ns	ns	18.2	ns	-16.0	24.1	ns	47.6	26.3	-14.4	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 3	mg/kg	lognormal	0.003	0.596	0.080	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Barium (Ba)	Fraction 4	mg/kg	lognormal	0.002	0.012	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	53.4	-46.5	45.6	-65.1	ns	172	ns	32.7	35.1	ns	ns	ns	ns	ns	33.1	ns	ns	ns
Danum (Da)	Fraction 5	mg/kg	lognormal	<0.001	0.500	0.105	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.042	0.002	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	21.8	30.5	24.5	ns	ns	ns	ns	21.6	ns	24.0	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.637	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	16.4	17.0	ns	21.4	17.7	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.069	0.086	ns	ns	ns	11.7	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Beryllium (Be)	Fraction 3	mg/kg	lognormal	<0.001	0.010	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	33.4	ns	ns	28.9	31.2	ns	ns	ns	ns	ns	23.0	35.3	42.4	ns
, , ,	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.005	nc	nc	nc	nc	nc	nc	ns	ns	ns	-18.9	-21.8	ns	ns	-17.9		-19.9	ns	29.2	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Fraction 1	mg/kg	lognormal	<0.001	0.053	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-44.8	ns	-60.1	ns	ns	ns	100	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	187	154
	Fraction 2	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-40.0	ns	47.6	40.6	146	74.9	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	35.5	ns
	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	101	312	ns	104	-33.9	-67.7	ns	ns	79.8	ns	61.6	ns	ns	ns	ns	ns	52.7	ns
Cadmium (Cd)	Fraction 4	mg/kg	lognormal	<0.001	0.204	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	83.8	74.6	ns	ns	-33.0		ns	ns	72.8	46.2	90.1	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	0.003	<0.001	0.006	nc	nc	nc	nc	nc	nc	ns	-29.2	-46.0	ns	-39.9	-23.7	-31.1	-30.1	-23.8	ns	ns	ns	ns	ns	-33.5	ns	-29.7	ns	ns	-26.4	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-51.2	-100.0		-100.0		904,103	ns	34.0	61.4 46.4	ns	46.3	ns	ns	ns	29.0	ns	64.3 53.7	27.6 26.1
	Sum of 1 to 5 Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001 <0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns 40.0	ns 180	41.9	ns 100	ns	ns -50.1	ns	26.1 30.2	56.7	ns	35.8 48.5	ns	ns	ns		ns	44.5	
	Fraction 1	mg/kg	lognormal	0.293	0.053	0.003	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns ns	ns	40.0 ns	ns		-27.2	ns	39.6	ns ns	56.3	48.6	ns		ns	ns	ns	ns	ns 36.5		ns
	Fraction 2	mg/kg	lognormal	<0.001	0.003	0.003	nc nc	nc	nc	nc	nc	nc	ns	ns	ns	ns 59.9	56.3	ns		51.8	ns 37.3		ns					ns	ns ne	ns	ns	ns	ns			ns ns
	Fraction 3	mg/kg mg/kg	lognormal lognormal	<0.001	0.002	0.015	nc	nc nc	nc	nc nc	nc nc	nc	ns ns	ns ns	ns ns	ns	ns	ns ns	ns ns	ns	ns	ns ns	ns ns	ns -63.9	ns ns	ns ns	ns ns	ns ns	ns ns	ns ns	ns ns	ns 298	ns ns	ns 196	ns ns	ns
	Fraction 4	mg/kg	lognormal	<0.001	0.036	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	39.3	ns	ns	ns	-26.5	-03.9 ns	ns	ns	ns	ns	ns	ns	ns	80.0	ns	53.9	ns	-35.2
Calcium (Ca)	Fraction 5	mg/kg	lognormal	<0.001	0.003	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-46.8	ns	ns	195	-20.5	-58.7	ns	-52.8	-59.4	-43.7	-51.6	ns	ns	ns	ns	ns	ns	-33.2 ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.005	0.218	ns	40.6	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.003	0.210	ns	38.7	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.000	0.200	ns	38.7	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	0 0			0.001	0.0.1	<b></b>		JJ															1													

P-value <0.05.

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

b The MOD was calculated as [EMM $_{Year\,2}^{*}$  EMM $_{Year\,1}^{*}$ ]/EMM $_{Year\,1}^{*}$ 100 for all years combined when the Area:Year term was insignificant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model. The MOD was calculated as [EMM $_{Year\,2}^{*}$  EMM $_{Year\,1}^{*}$ ]/EMM $_{Year\,1}^{*}$ 100 for each year when the Area:Year term was significant ( $\alpha$  = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.23: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, Based on Sequential Extraction Analysis, 2019 to 2022

							Yearly Magnitude of Difference																													
		ANOVA	Model ^a						Year E	ffects ^b	ı												Yea	r Effect	s by A	rea ^c										
			Assumed				2019	2019	2019	2020	2020	2021			RG_	GHP					RG_0	ЭНВР					RG_0	GAUT					RG_0	SANF		
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year	vs 2020	vs 2021	vs 2022	vs 2021	vs 2022	vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	vs	2021 vs 2022
	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-28.6	73.8	ns	143	35.0	-44.5	ns	-20.3	ns	ns	33.4	40.4						
Chromium (Cr)	Fraction 4	mg/kg	lognormal	0.061	0.126	0.013	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	62.2	ns	ns	64.3	ns	52.8	ns	ns	ns	ns	ns	ns	ns
	Fraction 5	mg/kg	lognormal	<0.001	0.011	0.216	ns	-11.1	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 1	mg/kg	lognormal	0.776	<0.001	0.012	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	172	179	158	ns	ns	ns	145	209	186	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.046	0.025	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	79.5	221	133	86.5	ns	124	91.8	ns	ns	ns									
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	-23.6	ns	-48.5	-65.7	ns	-33.5	54.9	133	ns	-23.6	-51.0	ns	-46.9	-35.8	-29.9	-45.3	ns	ns	ns	41.2
Cobalt (Co)	Fraction 4	mg/kg	lognormal	<0.001	0.263	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	-47.6	ns	-57.2	ns	89.3	ns											
, ,	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-38.6	ns	-36.2	-23.1	ns	-37.1	ns	-27.1	ns	58.0	ns	-23.4	-30.5	-22.7	-29.9	ns	ns	-24.5	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.013	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	-40.4	ns	69.7	ns	ns	-37.2	ns	-39.1	-31.2	ns	ns	ns	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-18.4	ns	ns	ns	ns	ns	ns	-36.7	ns	65.1	ns	ns	-34.0	-15.1	-36.6	-25.2	ns 20.4	ns	ns	ns	ns	ns 28.0
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001 <0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-24.8	-48.3	ns	-31.2	20.1	74.5	ns	-20.7	-47.6 174	ns	-44.2	-33.9	-20.4	-33.2	ns EE 2	-16.1	ns	
Copper (Cu)	Fraction 4	mg/kg	lognormal	<0.001	0.011 <0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns -34.4	ns	ns -34.2	ns -24.0	58.1	ns -35.6	ns	-52.5 -33.8	ns	57.6 69.2	ns	85.0		ns	82.2	ns	ns	ns	55.3	ns	ns	ns
	Fraction 5 Fraction 3	mg/kg	lognormal	<0.001	0.298	<0.001	nc	nc	nc	nc	nc	nc	ns	ns		ns	-34.2 ns		ns	50.0	ns 33.8		ns 47.8	ns	ns	ns	ns ns	ns	ns	ns	ns ns	ns	ns	ns	ns	ns 30.9
Iron (Fe)	Fraction 4	mg/kg mg/kg	lognormal lognormal	0.001	0.298	0.036	nc nc	nc	nc	nc	nc	nc	ns	ns	ns	ns ns		ns ns	ns	ns	ns	-43.1	ns	68.8	ns ns	ns ns	ns	ns ns	ns ns	ns ns	ns	ns ns	ns ns	ns	ns	ns
11011 (1 C)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.030	nc	nc	nc nc	nc nc	nc nc	nc nc	ns ns	ns ns	ns -35.4	ns	ns -34.6	ns	ns ns	ns	ns	ns	ns	ns	ns	-32.3	-45.8	-31.0	-44.7	ns	ns	-31.2	-31.8	ns ns	ns ns	ns
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	0.007	nc	nc	nc	nc	nc	nc	ns	-15.6	ns	ns	ns	29.4	ns	ns	22.6	ns	ns	15.9	ns	-18.3	ns	-15.6	ns	18.0	ns	ns	27.9	ns		27.2
Lead (Pb)	Fraction 4	mg/kg	lognormal	<0.001	0.124	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-51.4	ns	-54.4	-45.3	77.9	ns	ns	ns	ns	ns	ns	103	ns									
Load (i b)	Fraction 5	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-39.5	ns	-37.7	-32.9	ns	-45.1	ns	ns	ns	73.5	ns											
Lithium (Li)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	28.0	ns	39.3	ns	-27.4	ns	-19.9	-34.9	-27.6	-41.1	ns	ns	-21.0	-22.5	ns	ns	ns
Elitilatii (El)	Fraction 1	mg/kg	lognormal	0.493	<0.001	0.007	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	2,004	1,480	504	ns	ns	ns	782	787	1,121	ns	ns	ns	349	682	430	ns	ns	ns
	Fraction 2	mg/kg	lognormal	0.190	<0.001	0.188	45.7	59.5	32.1	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 3	mg/kg	lognormal	<0.001	0.012	0.005	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-59.6	ns	ns	101	ns	ns	ns	ns	ns	ns	-47.7	ns	-51.0	-57.4	ns	ns	ns	ns
	Fraction 4	mg/kg	lognormal	<0.001	0.019	0.038	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-39.8	ns	ns	-40.0	ns	ns	ns	ns
Manganese (Mn)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.002	nc	nc	nc	nc	nc	nc	ns	ns	-40.4	ns	-38.2	ns	-33.4	-44.6	-34.6	-45.7	ns	ns	-29.0	ns	ns	ns	ns							
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.036	0.781	ns	ns	ns	ns	ns	-21.5	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.025	0.718	ns	ns	ns	ns	ns	-20.9	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.065	0.178	ns	ns	ns	ns	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Molybdenum (Mo)	Fraction 5	mg/kg	lognormal	<0.001	0.294	0.010	nc	nc	nc	nc	nc	nc	ns	ns	-32.2	ns	-30.1	ns	ns	ns	ns	53.4	ns													
	Fraction 1	mg/kg	lognormal	<0.001	0.180	<0.001	nc	nc	nc	nc	nc	nc	ns	53.1	ns	65.6	49.1	ns	92.6	-35.1	ns	-66.3	ns	107	ns											
	Fraction 2	mg/kg	lognormal	<0.001		<0.001	nc	nc	nc	nc	nc	nc		26.8						-55.1			-45.1		ns	-40.7	ns	-24.9	ns	ns	ns	ns	-37.3	ns	-32.9	-24.2
	Fraction 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	23.0	19.7	25.5	22.1	ns	22.3	-70.5	ns	-75.9	ns	247	ns	-23.1	-46.8	ns	-37.5	-30.8	-27.7	-33.6	-19.1	ns	ns	21.8
Nickel (Ni)	Fraction 4	mg/kg	lognormal	<0.001	0.104	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	103	-68.1	ns	-84.3	-42.6	266	ns											
INIONGI (INI)	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.004	nc	nc	nc	nc	nc	nc	ns	-23.6	-40.9	ns	-38.9	-22.7	ns	-30.8			ns		ns	ns	-30.5	ns	-29.7	ns	ns	-27.1	ns	ns	ns	ns
	Sum of 1 to 4	mg/kg	lognormal	<0.001		<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	53.1	-66.4			-32.2		ns											
	Sum of 1 to 5	mg/kg	lognormal	<0.001			nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns		-61.9			-29.0		ns		-23.2		ns	ns						
	Sum of 2 and 3	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	23.8	24.2	29.2	29.6	ns	32.6	-66.3	ns	-74.6	-25.5	193	ns	-26.4	ns	ns	ns	ns	-23.6	-30.4	-27.6	ns	ns	ns

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; ns = not significant; nc = no comparison; HSD = Honestly Significant Difference.

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

b The MOD was calculated as [EMM_{Year 2}* EMM_{Year 1}]/EMM_{Year 1}*100 for all years combined when the Area:Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model. The MOD was calculated as [EMM_{Year 2}* EMM_{Year 1}*100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.23: Differences in Concentrations of Sediment Quality Constituents Among Years on Lower Greenhills and Gardine Creeks Sampling Areas, Based on Sequential Extraction Analysis, 2019 to 2022

																			١	Yearly N	/lagnitue	de of Di	ifferenc	e												
		ANOVA	Model ^a						Year E	ffects ^b													Yea	ar Effec	ts by A	rea ^c										
0	Function	11:4-	Assumed	A	V	A V	2019	2019	2019	2020	2020	2021			RG_	GHP					RG_C	ЭНВР					RG_0	GAUT					RG_0	GANF		
Constituent	Fraction	Units	Distribution	Area	Year	Area:Year	vs 2020	vs 2021	vs 2022	vs 2021	vs 2022	vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022	2019 vs 2020	2019 vs 2021	2019 vs 2022	2020 vs 2021	2020 vs 2022	2021 vs 2022
Phosphorus (P)	Fraction 3	mg/kg	lognormal	<0.001	0.182	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	-38.0	ns	ns	-36.7	ns	65.1	ns	ns	ns	-56.6	-50.4	ns	ns	61.4	ns							
	Fraction 1	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	31.6	ns	47.5	ns	ns	34.8	ns	ns	ns	-26.3	ns	33.8	ns	70.7	59.6	ns								
Potassium (K)	Sum of 1 to 4	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	31.6	ns	47.5	ns	ns	34.8	ns	ns	ns	-26.3	ns	33.8	ns	70.7	59.6	ns								
, ,	Sum of 1 to 5	mg/kg	lognormal	0.987	<0.001	<0.001	nc	nc	nc	nc	nc	nc	31.6	ns	47.5	ns	ns	34.8	ns	ns	ns	-26.3	ns	33.8	ns	70.7	59.6	ns								
	Fraction 1	mg/kg	lognormal	<0.001	0.510	0.028	nc	nc	nc	nc	nc	nc	ns	140	ns	197	ns	ns	ns	ns	ns	-61.0	ns													
Solonium (So)	Fraction 3	mg/kg	lognormal	<0.001	0.392	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	169	ns	171	ns	ns	-57.4	ns	-72.6	ns	115	-98.8	ns	-98.9	11,746	ns	-99.2	3,056	7,717	ns	ns	-97.0	-98.8
Selenium (Se)	Fraction 4	mg/kg	lognormal	<0.001	0.120	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	109	ns	ns	-69.3	ns	-82.8	ns	280	ns											
	Fraction 5	mg/kg	lognormal	<0.001	0.011	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	81.6	-67.8	ns	-82.3	ns	290	ns											
Silver (Ag)	Fraction 5	mg/kg	lognormal	<0.001	0.979	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	-44.2	ns	-48.6	ns	97.4	ns	70.2	ns									
	Fraction 1	mg/kg	lognormal	<0.001	0.001	0.210	ns	29.5	ns	20.5	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 2	mg/kg	lognormal	<0.001	0.007	0.002	nc	nc	nc	nc	nc	nc	ns	ns	49.3	42.8	83.5	ns	ns	73.4	ns	45.4	ns													
	Fraction 3	mg/kg	lognormal	<0.001	0.025	0.022	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	139	ns	ns	ns	-65.8	ns	132	ns	ns	ns	ns						
Strontium (Sr)	Fraction 4	mg/kg	lognormal	0.049	0.021	0.005	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	25.8	ns	ns	-29.3	ns	36.1	ns											
Strontium (Sr)	Fraction 5	mg/kg	lognormal	<0.001	0.035	0.031	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	-21.4	ns	-24.4	ns	28.2															
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.004	0.043	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	56.1	ns	ns	64.0	ns	ns	ns	-39.0	ns											
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.033	0.013	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	34.2	ns	-28.2	ns	28.4	ns	ns	ns	ns						
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.016	0.024	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	81.6	ns	ns	95.8	ns	ns	ns	-47.4	ns											
Thallium (TI)	Fraction 5	mg/kg	lognormal	0.007	0.030	0.059	ns	ns	-12.5	ns	-12.6	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Titonium (Cn)	Fraction 4	mg/kg	lognormal	<0.001	<0.001	<0.001	nc	nc	nc	nc	nc	nc	ns	-69.5	-90.1	-67.8	-89.6	-67.6	ns	-93.0	-83.1	-93.0	-83.0	ns												
Titanium (Sn)	Fraction 5	mg/kg	lognormal	<0.001	0.015	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	102	ns	119	ns	-54.4	99.7	ns	47.5	-38.7	-26.2	ns						
	Fraction 1	mg/kg	lognormal	<0.001	0.020	0.001	nc	nc	nc	nc	nc	nc	ns	ns	132	ns	137	ns																		
	Fraction 2	mg/kg	lognormal	<0.001	0.021	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	102	ns	163	ns	91.1	ns	ns	-64.2	ns	83.3	ns											
	Fraction 3	mg/kg	lognormal	<0.001	0.034	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	61.1	ns	-49.4	ns	-60.4	ns	80.2	ns	ns	ns	ns	67.0	ns						
Uranium (U)	Fraction 4	mg/kg	lognormal	<0.001	0.135	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	-47.2	ns	-60.3	ns	146	ns	ns	58.9	ns	52.9	ns						
Uranium (U)	Fraction 5	mg/kg	lognormal	<0.001	0.172	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	-25.8	ns	-27.5	ns	ns	65.4	ns	-24.1	ns											
	Sum of 1 to 4	mg/kg	lognormal	<0.001	0.062	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 1 to 5	mg/kg	lognormal	<0.001	0.074	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.024	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	64.8	ns	93.2	ns	ns	-43.3	ns	-62.1	ns	81.3	ns											
	Fraction 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	-15.1	83.4	26.0	116	48.4	-31.3	ns	40.6	ns	43.1	46.5							
Vanadium (V)	Fraction 4	mg/kg	lognormal	<0.001	0.067	0.004	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	ns	-36.8	ns	-40.0	ns	95.2	ns											
	Fraction 5	mg/kg	lognormal	<0.001	0.002	0.368	ns	-11.6	ns	-15.4	ns	ns	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	Fraction 2	mg/kg	lognormal	<0.001	0.003	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	36.5	ns	36.3	ns	57.1	67.5	ns	ns	ns	-24.0	ns	ns	-24.1	ns	-28.4	-26.5	ns	ns	ns	ns	ns	-25.3
	Fraction 3	mg/kg	lognormal	<0.001	0.005	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	80.0	64.3	32.6	ns	-26.3	ns	28.0	ns	35.0	ns								
Zinc (Zn)	Fraction 4	mg/kg	lognormal	<0.001	0.006	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	ns	ns	110	ns	56.8	-42.4	ns	ns	ns	82.2	100.0	55.5	70.7	ns						
, ,	Fraction 5	mg/kg	lognormal	<0.001	<0.001	0.011	nc	nc	nc	nc	nc	nc	ns	ns	-39.1	ns	-37.4	-25.0	ns	-25.3	ns	ns	ns	37.2	ns	-25.5	-32.3	ns	-26.5	ns	ns	-27.4	ns	ns	ns	ns
	Sum of 2 and 3	mg/kg	lognormal	<0.001	0.002	<0.001	nc	nc	nc	nc	nc	nc	ns	ns	ns	ns	22.8	ns	74.0	65.6	31.0	ns	-24.7	-20.9	ns	25.2	ns									
	1	5.5						1	1	1		1	1	1	1							1				1	I .	ı	1	1			1			

Positive MOD (higher concentration of constituent at later year relative to earlier year).

Negative MOD (lower concentration of constituent at the later year relative to the earlier year).

^a Censored regression Analysis of Variance (ANOVA) with factor Area, Year and Area: Year. Post-hoc contrasts were excluded from the analyses.

b The MOD was calculated as [EMM_{Year 2}* EMM_{Year 1}*/100 for all years combined when the Area:Year term was insignificant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model. The MOD was calculated as [EMM_{Year 2}* EMM_{Year 1}*/100 for each year when the Area:Year term was significant (α = 0.05). The EMM is the estimated marginal mean from the censored regression model.

Table F.24: Sediment Quality Indices (SQI) for Biological Monitoring Areas on Greenhills and Gardine Creeks, 2013 to 2022

Biological Monitoring Area	Year	SQI ^a	F1 (Scope) ^b	F2 (Area Frequency) ^c	F3 (Amplitude) ^d	Sample Size ^e
	2019	30.2	70.0	49.5	85.3	99
DC CALIT	2020	35.5	50.0	46.0	88.7	100
RG_GAUT	2021	24.5	75.0	49.0	95.2	100
	2022	27.0	65.0	50.5	95.9	97
	2019	33.9	55.0	45.0	89.8	100
RG_GANF	2020	37.2	45.0	38.0	91.4	100
KG_GAINE	2021	33.1	50.0	43.0	95.3	100
	2022	30.0	55.0	46.9	97.2	98
	2013	24.9	70.0	50.9	97.2	163
	2017	24.6	70.0	55.0	95.6	120
RG_GHP	2019	20.7	75.0	62.5	96.6	120
KG_GHP	2020	20.8	70.0	66.0	97.8	100
	2021	24.1	65.0	59.2	97.8	98
	2022	21.6	70.0	62.5	98.1	120
	2017	31.6	60.0	46.0	91.2	100
	2018	26.6	65.0	54.0	95.0	100
RG_GHBP	2019	26.8	70.0	51.0	92.7	100
КО_ОПВР	2020	25.4	65.0	57.0	96.1	100
	2021	24.1	65.0	59.6	97.5	99
	2022	27.1	65.0	54.7	93.4	95

Notes: Non-detect data were replaced with the LRL to support calculation of the SQI. Calculations were derived using a total of 20 BC WSQG, including the alert concentration for selenium (BCMOECCS 2021a,b). SQI = Sediment Quality Index; LRL = Laboratory Reporting Limit; BC WSQG = British Columbia Working Sediment Quality Guidelines; no. = number.

 $^{^{}a}$  SQI = 100 - (sqr(F1 2 +F2 2 +F3 2 )/1.732).

^b Percentage of constituents that did not meet their respective guidelines (i.e., no. of constituents with failed samples/total no. of constituents*100).

^c Percentage of samples that did not meet their respective guidelines (i.e., no. of failed samples/total no. of samples*100).

^d Normalized sum of extent above guidelines scaled between 0 and 100.

^e Sample sizes reported in 2022 were smaller relative to 2021 due to higher scrutiny over PAH concentrations and exclusion of PAHs with LRLs that were raised due to potential evaporation-related effects associated with the drying process.

Table F.25: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHBP-1 on Lower Greenhills Creek, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	453	2,160	6,660	<2,713	<9,373	<503	9,390
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.720	<0.4	<1.12	<0.2	0.830
Arsenic (As)	mg/kg	5.90	17.0	<0.05	0.0530	0.414	0.718	<5	<1.24	<6.24	0.467	6.95
Barium (Ba)	mg/kg	-	-	9.20	33.2	35.7	30.5	133	109	242	68.9	196
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.270	<0.2	0.320	<0.87	<1.19	<0.47	0.790
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	10.0
Cadmium (Cd)	mg/kg	0.600	3.50	0.168	0.596	0.756	0.127	0.0690	1.65	1.72	1.35	1.01
Calcium (Ca)	mg/kg	-	-	5,800	35,300	8,090	1,630	239	50,820	51,059	43,390	41,500
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.570	5.19	9.90	<11.3	<21.2	<5.57	14.1
Cobalt (Co)	mg/kg	-	-	0.140	0.640	3.39	1.98	2.18	6.15	8.33	4.03	8.55
Copper (Cu)	mg/kg	35.7	197	0.920	<0.5	0.530	11.4	11.7	<13.4	<25	<1.03	17.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,150	3,350	7,770	<6,600	<14,370	<3,200	20,400
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.29	2.05	5.91	<6.34	<12.2	<3.79	13.2
Lithium (Li)	mg/kg	-	-	<5	<5	<b>&lt;</b> 5	<5	<5	<20	<25	<10	13.9
Magnesium (Mg)	mg/kg	-	-	1	-	ı	-	=	=	-	-	6,020
Manganese (Mn)	mg/kg	460	1,100	20.6	113	172	18.1	31.7	324	355	285	520
Mercury (Hg)	mg/kg	0.170	0.486	-	-	•	-	=	-	-	-	0.0408
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	< 0.5	< 0.5	0.890	<2	<2.89	<1	1.66
Nickel (Ni)	mg/kg	16.0	75.0	2.45	12.6	45.7	35.6	9.60	96.3	106	58.3	63.5
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	150	-	-	<250	<250	<200	1,290
Potassium (K)	mg/kg	-	-	140	-	-	-	=	140	140	-	2,050
Selenium (Se) b	mg/kg	2.0	00	0.450	0.260	2.13	20.3	3.09	23.1	26.2	2.39	6.85
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.240	<0.4	<0.64	<0.2	0.200
Sodium (Na)	mg/kg	-	-	<100	-	-	-	=	<100	<100	-	76.0
Strontium (Sr)	mg/kg	-	-	7.02	15.6	6.44	4.82	19.4	33.9	53.3	22.0	49.4
Sulfur (S)	mg/kg	-	-	-	-	-	-	=	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	<0.05	<0.05	0.174	<0.2	<0.374	<0.1	0.237
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	8.70	14.9	<15.7	<30.6	<6	15.8
Tungsten (W)	mg/kg	-	-	-	-	=	-	=	-	-	-	<0.5
Uranium (U)	mg/kg	-	-	0.0580	0.281	0.434	0.545	0.277	1.32	1.60	0.715	1.04
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.04	6.84	22.9	<9.28	<32.2	<2.24	30.4
Zinc (Zn)	mg/kg	123	315	<1	19.8	64.2	17.8	50.9	<103	<154	84.0	132

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021B).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.26: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHBP-2 on Lower Greenhills Creek, September 2022

		BC W	SQG ^a				SEA	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	446	1,670	8,330	<2,216	<10,546	<496	6,480
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.700	<0.4	<1.1	<0.2	0.830
Arsenic (As)	mg/kg	5.90	17.0	<0.05	<0.05	0.372	0.416	5.16	<0.888	<6.05	<0.422	6.26
Barium (Ba)	mg/kg	-	-	12.3	38.0	33.3	23.2	134	107	241	71.3	173
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.260	<0.2	0.380	<0.86	<1.24	<0.46	0.680
Bismuth (Bi)	mg/kg	-	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	1	-	-	-	-	-	-	-	-	5.80
Cadmium (Cd)	mg/kg	0.600	3.50	0.250	0.625	0.590	0.0820	0.0990	1.55	1.65	1.22	1.20
Calcium (Ca)	mg/kg	-	1	4,290	40,700	8,500	1,500	732	54,990	55,722	49,200	50,400
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	0.710	4.00	12.1	<10.2	<22.3	<5.71	10.8
Cobalt (Co)	mg/kg	-	-	0.200	0.770	3.09	1.33	2.89	5.39	8.28	3.86	7.62
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	<0.5	6.79	14.4	<8.29	<22.7	<1	16.7
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	2,760	2,280	12,200	<5,140	<17,340	<2,810	17,900
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.44	1.00	6.82	<5.44	<12.3	<3.94	12.6
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	6.70	<20	<26.7	<10	11.7
Magnesium (Mg)	mg/kg	_	-	-	-	-	-	-	-	-	-	5,310
Manganese (Mn)	mg/kg	460	1,100	61.8	108	208	16.2	46.6	394	441	316	433
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0491
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	1.12	<2	<3.12	<1	1.84
Nickel (Ni)	mg/kg	16.0	75.0	1.96	9.80	29.2	16.6	12.0	57.6	69.6	39.0	51.6
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	141	-	_	<241	<241	<191	1,240
Potassium (K)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	1,300
Selenium (Se) b	mg/kg	2.	00	0.270	<0.2	1.17	8.53	1.80	<10.2	<12	<1.37	5.54
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.160	<0.4	<0.56	<0.2	0.240
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	59.0
Strontium (Sr)	mg/kg	-	_	5.07	17.8	7.23	4.90	22.0	35.0	57.0	25.0	50.4
Sulfur (S)	mg/kg	-	_	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	<0.05	<0.05	0.185	<0.2	<0.385	<0.1	0.192
Tin (Sn)	mg/kg	-	_	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<u>-</u> <1	<5	<u>-</u> <1	18.7	13.3	<25.7	<39	<6	10.3
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (U)	mg/kg	-	_	<0.05	0.358	0.410	0.395	0.348	<1.21	<1.56	0.768	1.13
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.24	5.56	27.3	<8.2	<35.5	<2.44	23.0
Zinc (Zn)	mg/kg	123	315	<1	22.7	57.0	9.10	69.2	<89.8	<159	79.7	136

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.27: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHBP-3 on Lower Greenhills Creek, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	410	1,850	6,440	<2,360	<8,800	<460	7,440
Antimony (Sb)	mg/kg		-	<0.1	<0.1	<0.1	<0.1	0.680	<0.4	<1.08	<0.2	0.780
Arsenic (As)	mg/kg	5.90	17.0	<0.05	<0.05	0.326	0.642	<5	<1.07	<6.07	<0.376	7.36
Barium (Ba)	mg/kg		-	10.9	38.5	30.5	38.0	143	118	261	69.0	223
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.230	<0.2	0.280	<0.83	<1.11	<0.43	0.680
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg		-	-	-	-	-	=	-	-	-	5.80
Cadmium (Cd)	mg/kg	0.600	3.50	0.185	0.681	0.710	0.117	0.0630	1.69	1.76	1.39	1.40
Calcium (Ca)	mg/kg		-	5,030	42,500	15,800	2,020	321	65,350	65,671	58,300	62,700
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.640	4.20	9.40	<10.3	<19.7	<5.64	12.4
Cobalt (Co)	mg/kg		-	0.280	0.900	3.08	1.78	2.21	6.04	8.25	3.98	9.61
Copper (Cu)	mg/kg	35.7	197	1.23	<0.5	<0.5	9.62	11.0	<11.8	<22.8	<1	19.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	2,610	2,800	7,930	<5,510	<13,440	<2,660	21,800
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.45	1.67	5.40	<6.12	<11.5	<3.95	11.7
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	12.0
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	6,010
Manganese (Mn)	mg/kg	460	1,100	85.7	136	161	13.9	31.0	397	428	297	701
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0422
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	< 0.5	< 0.5	< 0.5	0.790	<2	<2.79	<1	1.52
Nickel (Ni)	mg/kg	16.0	75.0	3.36	12.2	42.1	30.0	9.40	87.7	97.1	54.3	68.9
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	122	-	-	<222	<222	<172	1,190
Potassium (K)	mg/kg	-	-	150	-	-	-	-	150	150	-	1,990
Selenium (Se) b	mg/kg	2.	00	0.280	0.220	1.56	12.9	2.03	15.0	17.0	1.78	6.14
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.200	<0.4	<0.6	<0.2	0.200
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	104
Strontium (Sr)	mg/kg	-	-	6.25	18.4	9.06	5.61	18.8	39.3	58.1	27.5	55.6
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	<1,000
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	< 0.05	<0.05	0.153	<0.2	< 0.353	<0.1	0.192
Tin (Sn)	mg/kg	-		<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	23.4	11.1	<30.4	<41.5	<6	11.4
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (U)	mg/kg	-	•	0.0590	0.347	0.408	0.407	0.256	1.22	1.48	0.755	1.06
Vanadium (V)	mg/kg	-		<0.2	<0.2	2.03	6.02	22.0	<8.45	<30.4	<2.23	26.2
Zinc (Zn)	mg/kg	123	315	<1	24.3	74.5	14.3	52.7	<114	<167	98.8	149

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.28: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHBP-4 on Lower Greenhills Creek, September 2022

	Units mg/kg	BC WS	Upper	Fraction 1:	<b>-</b>		F 41 4 .					
	ma/ka		Орреі	Exchangeable and Adsorbed Metals	Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
		-	-	<50.0	<50.0	342	1,400	6,640	<1,842	<8,482	<392	6,190
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.640	<0.4	<1.04	<0.2	0.620
	mg/kg	5.90	17.0	<0.05	<0.05	0.260	0.450	<5	<0.81	<5.81	<0.31	4.45
Barium (Ba)	mg/kg	-	-	17.6	46.1	36.1	30.5	140	130	270	82.2	232
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.270	<0.2	0.320	<0.87	<1.19	<0.47	0.580
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	6.30
Cadmium (Cd)	mg/kg	0.600	3.50	0.175	0.529	0.491	0.0810	0.0910	1.28	1.37	1.02	1.23
Calcium (Ca)	mg/kg	-	-	4,320	45,900	24,300	2,110	730	76,630	77,360	70,200	71,300
	mg/kg	37.3	90.0	<0.5	<5	0.600	3.55	9.70	<9.65	<19.4	< 5.6	9.85
	mg/kg	-	-	<0.1	0.380	3.62	1.47	2.58	<5.57	<8.15	4.00	7.51
	mg/kg	35.7	197	1.29	<0.5	<0.5	7.14	11.9	<9.43	<21.3	<1	16.0
	mg/kg	21,200	43,766	<50.0	<50.0	2,260	2,080	9,990	<4,440	<14,430	<2,310	12,900
	mg/kg	35.0	91.3	<0.5	<0.5	3.91	0.740	5.64	< 5.65	<11.3	<4.41	10.3
` /	mg/kg	-	-	<5	<5	<5	<5	5.50	<20	<25.5	<10	9.20
` ,	mg/kg	-	-	-	-	-	-	-	-	-	-	5,530
· · · · · ·	mg/kg	460	1,100	10.5	80.7	261	14.3	38.5	366	405	342	435
	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0545
3 ( 0)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.880	<2	<2.88	<1	1.22
	mg/kg	16.0	75.0	1.82	9.20	30.9	21.3	10.4	63.2	73.6	40.1	65.3
` '	mg/kg	-	-	<50.0	<50.0	68.0	-	-	<168	<168	<118	1,080
	mg/kg	-	-	130	-	=	-	-	130	130	-	1,390
. ,	mg/kg	2.0	00	<0.2	0.210	1.21	8.40	1.36	<10	<11.4	1.42	8.40
	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.150	<0.4	<0.55	<0.2	0.240
	mg/kg	-	-	<100	-	=	-	-	<100	<100	-	72.0
	mg/kg	-	-	5.82	20.4	11.9	5.42	20.5	43.5	64.0	32.3	58.7
` ′	mg/kg	-	-	-	-	-	-	-	-	-	-	1,400
` '	mg/kg	-	-	<0.05	<0.05	<0.05	<0.05	0.157	<0.2	< 0.357	<0.1	0.180
\ /	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
` '	mg/kg	-	-	<1	<5	<1	17.7	11.2	<24.7	<35.9	<6	9.80
` ,	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
	mg/kg	-	-	0.0500	0.376	0.448	0.324	0.336	1.20	1.53	0.824	1.36
` '	mg/kg	-	-	<0.2	<0.2	2.00	5.10	22.4	<7.5	<29.9	<2.2	21.8
` /	mg/kg	123	315	<1	17.5	50.2	8.00	58.0	<76.7	<135	67.7	124

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.29: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHBP-5 on Lower Greenhills Creek, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	252	872	5,550	<1,224	<6,774	<302	4,100
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.560	<0.4	<0.96	<0.2	0.330
Arsenic (As)	mg/kg	5.90	17.0	0.0600	0.0700	0.329	0.322	<5	0.781	<5.78	0.399	2.86
Barium (Ba)	mg/kg	-	-	10.8	34.4	51.9	26.1	86.7	123	210	86.3	136
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.210	<0.2	0.240	<0.81	<1.05	<0.41	0.360
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	6.20
Cadmium (Cd)	mg/kg	0.600	3.50	< 0.05	0.491	0.956	0.0840	0.0690	<1.58	<1.65	1.45	1.10
Calcium (Ca)	mg/kg	-	-	3,270	45,300	90,200	2,530	721	141,300	142,021	135,500	107,000
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.510	2.33	7.80	<8.34	<16.1	<5.51	6.25
Cobalt (Co)	mg/kg	-	-	0.230	0.810	1.95	1.28	1.99	4.27	6.26	2.76	5.08
Copper (Cu)	mg/kg	35.7	197	1.35	<0.5	<0.5	6.92	8.60	<9.27	<17.9	<1	10.1
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	1,550	1,440	7,510	<3,090	<10,600	<1,600	9,010
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	3.82	<0.5	3.21	<5.32	<8.53	<4.32	6.32
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	6.40
Magnesium (Mg)	mg/kg	-	_	-	-	-	-	-	-	-	-	5,010
Manganese (Mn)	mg/kg	460	1,100	51.3	116	128	6.70	31.8	302	334	244	281
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0305
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	0.640	<2	<2.64	<1	0.720
Nickel (Ni)	mg/kg	16.0	75.0	2.76	11.5	27.8	17.5	8.00	59.6	67.6	39.3	46.3
Phosphorus (P)	mg/kg	-	_	<50.0	<50.0	136	-	-	<236	<236	<186	725
Potassium (K)	mg/kg	-	_	160	-	-	-	-	160	160	-	1,020
Selenium (Se) b	mg/kg	2.	00	0.460	0.370	2.68	11.9	2.01	15.4	17.4	3.05	7.66
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.110	<0.4	<0.51	<0.2	0.130
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	69.0
Strontium (Sr)	mg/kg	-	-	4.60	19.4	37.2	4.05	17.0	65.2	82.2	56.6	60.8
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,700
Thallium (TI)	mg/kg	-	-	<0.05	<0.05	<0.05	<0.05	0.123	<0.2	<0.323	<0.1	0.107
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	13.8	10.2	<20.8	<31	<6	9.10
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (U)	mg/kg	-	-	0.0630	0.377	0.586	0.192	0.251	1.22	1.47	0.963	0.959
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	1.65	3.35	17.9	<5.4	<23.3	<1.85	14.0
Zinc (Zn)	mg/kg	123	315	<1	23.2	67.2	7.00	44.7	<98.4	<143	90.4	103

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.30: Annual Differences in Sediment Quality in Lower Greenhills Creek (RG_GHBP) for Years Before (2017) and After (2018 to 2022) Initiation of Antiscalant Treatment

A	•								ODs (%) ear (201		ve to
Constituent  Moisture  Sand (0.125 to 0.063 mm)		Units		Treatment	Year (Treatment)	Treatment Effects ^a	Tre 2018	atment 2019	Effects 2020	by Yea	ars ^b
	Moisture	%		0.056	` '	nc	45.2	ns	34.4	39.6	ns
_		%	0	0.409	0.381	ns	nc	nc	nc	nc	no
-	Sand (0.25 to 0.125 mm)	%	0	0.340	0.431	ns	nc	nc	nc	nc	no
=	Sand (0.50 to 0.25 mm)	%	6.7	0.483	0.922	ns	nc	nc	nc	nc	ne
	Sand (1.00 to 0.50 mm)	%	10	0.656	0.996	ns	nc	nc	nc	nc	n
Physical Tests –	Sand (2.00 to 1.00 mm)	%	20	0.129	1.000	ns	nc	nc	nc	nc	n
=	Silt (0.0312 to 0.004 mm)	%	0	0.196	0.854	ns	nc	nc	nc	nc	n
	Silt (0.063 to 0.0312 mm)	%	0	0.114	0.442	ns	nc	nc	nc	nc	n
	Clay (<4 µm)	%	0	0.362	0.040	nc	ns	ns	ns	ns	75
	Gravel (>2 mm)	%	50	0.300	0.995	ns	nc	nc	nc	nc	n
rganic Carbon	Total Organic Carbon	%	0	0.192	0.950	ns	nc	nc	nc	nc	n
	Aluminum (AI)	mg/kg	0	0.446	0.761	ns	nc	nc	nc	nc	n
	Antimony (Sb)	mg/kg	0	0.460	0.937	ns	nc	nc	nc	nc	n
	Arsenic (As)	mg/kg	0	0.551	0.880	ns	nc	nc	nc	nc	r
	Barium (Ba)	mg/kg	0	0.572	0.204	ns	nc	nc	nc	nc	r
	Beryllium (Be)	mg/kg	0	0.421	0.972	ns	nc	nc	nc	nc	n
	Boron (B)	mg/kg	10	0.926	0.002	nc	ns	ns	63.5	ns	r
=	Cadmium (Cd)	mg/kg	0	0.880	0.113	ns	nc	nc	nc	nc	r
	Calcium (Ca)	mg/kg	0	0.697	0.997	ns	nc	nc	nc	nc	r
=	Chromium (Cr)	mg/kg	0	0.092	0.993	ns	nc	nc	nc	nc	r
	Cobalt (Co)	mg/kg	0	0.727	0.320	ns	nc	nc	nc	nc	r
_	Copper (Cu)	mg/kg	0	0.677	0.972	ns	nc	nc	nc	nc	r
_	Iron (Fe)	mg/kg	0	0.714	0.908	ns	nc	nc	nc	nc	r
	Lead (Pb)	mg/kg	0	0.333	0.968	ns	nc	nc	nc	nc	r
	Lithium (Li)	mg/kg	0	0.393	0.726	ns	nc	nc	nc	nc	r
_	Magnesium (Mg)	mg/kg	0	0.936	0.035	nc	ns	ns	ns	ns	r
Metals	Manganese (Mn)	mg/kg	0	0.027	0.924	27.1	nc	nc	nc	nc	r
-	Mercury (Hg)	mg/kg	0	0.664	0.037	nc	ns	ns	63.7	ns	r
	Molybdenum (Mo)	mg/kg	0	0.297	0.956	ns	nc	nc	nc	nc	r
_	Nickel (Ni)	mg/kg	0	0.869	0.006	nc	ns	ns	ns	ns	-3
_	Phosphorus (P)	mg/kg	0	0.612	0.957	ns	nc	nc	nc	nc	r
_	Potassium (K)	mg/kg	0	0.386	0.578	ns	nc	nc	nc	nc	r
_	Selenium (Se)	mg/kg	0	0.084	<0.001	nc	ns	ns	169	130	r
_	Silver (Ag)	mg/kg	3.3	0.799	0.968	ns	nc	nc	nc	nc	r
_	Sodium (Na)	mg/kg	0	0.438	0.024	nc	38.9	ns	ns	ns	r
_	Strontium (Sr)	mg/kg	0	0.613	0.937	ns	nc	nc	nc	nc	r
=	Sulfur (S)	mg/kg	27	0.411	0.443	ns	nc	nc	nc	nc	r
=	Thallium (TI)	mg/kg	0	0.139	0.198	ns	nc	nc	nc	nc	r
=	Titanium (Ti)	mg/kg	0	0.014	<0.001	nc	128	ns	411	ns	r
=	Uranium (U)	mg/kg	0	0.302	0.010	nc	ns	ns	51.4	ns	r
=	Vanadium (V)	mg/kg	0	0.349	0.943	ns	nc	nc	nc	nc	1
=	Zinc (Zn)	mg/kg	0	0.255	<0.001	nc	ns	ns	42.7	ns	1
	Zirconium (Zr)	mg/kg	43	0.700	0.339	ns	nc	nc	nc	nc	1
-	Acenaphthylene	mg/kg	63	0.595	0.312	ns	nc	nc	nc	nc	1
-	B(a)P Total Potency Equivalent		0	0.042	0.047	nc	ns	ns	181	259	ı
-	Benz(a)anthracene	mg/kg	40	0.172	0.059	ns	nc	nc	nc	nc	ı
_	Benzo(a)pyrene	mg/kg	13	0.039	0.078	109	nc	nc	nc	nc	ı
_	Benzo(b&j)fluoranthene	mg/kg	0	0.041	0.079	87.7	nc	nc	nc	nc	
-	Benzo(e)pyrene	mg/kg	0	0.009	0.122	136	nc	nc	nc	nc	
-	Benzo(g,h,i)perylene	mg/kg	3.3	0.007	0.054	152	nc	nc	nc	nc	ı
-	Benzo(k)fluoranthene	mg/kg	73	0.243	0.266	ns	nc	nc	nc	nc	ı
-	Chrysene	mg/kg	13	0.053	0.731	ns	nc	nc	nc	nc	!
_	d10-Acenaphthene	mg/kg	0	0.196	<0.001	nc	ns	ns	22.9	33.7	
Polycyclic	d12-Chrysene	mg/kg	0	0.737	<0.001	nc	ns	-14.5	18.4	13.8	
Aromatic ydrocarbons	d8-Naphthalene	mg/kg	0	0.211	<0.001	nc	ns	ns	23.0	32.9	
, 4, 554, 501, 5	Dibenz(a,h)anthracene	mg/kg	43	0.202	0.015	nc	ns	ns	168	210	
-	Fluoranthene	mg/kg	3.3	0.029	0.145	97.3	nc	nc	nc	nc	!
-	Fluorene	mg/kg	0	0.007	0.078	176	nc	nc	nc	nc	!
-	IACR (CCME)	mg/kg	0	0.034	0.085	89.6	nc	nc	nc	nc	
-	Indeno(1,2,3-c,d)pyrene	mg/kg	43	0.030	0.652	32.3	nc	nc	nc	nc	
-	1-Methylnaphthalene	mg/kg	0	0.012	0.078	145	nc	nc	nc	nc	ı
	2-Methylnaphthalene	mg/kg	0	0.018	0.093	138	nc	nc	nc	nc	
	Naphthalene	mg/kg	0	0.013	0.075	168	nc	nc	nc	nc	r
-	·		_	^ ^	0.40-	40-					
<u> </u>	Phenanthrene Phenanthrene d10	mg/kg mg/kg	0	0.012 0.180	0.195 <0.001	125 nc	nc ns	nc ns	nc 11.4	nc 22.9	r

Main effect p-value <0.05; interaction p-value <0.05.

Positive MOD (higher concentration of constituent after initation of treatment (i.e., in 2018, 2019, 2020, 2021, and/or 2022) relative to before (2017) treatment.

Negative MOD (lower concentration of constituent after initation of treatment (i.e., in 2018, 2019, 2020, 2021, and/or 2022) relative to before (2017) treatment.

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; % = percent; < = less than; nc = not calculated; ns = not significant; mm = millimetres; µm = micrometre; > = greater than; mg/kg = milligrams per kilogram; LRL = Laboratory Reporting Limit; MCT = Measure of Central Tendency.

Constituents with >75% of reported values <LRL were excluded from the analysis. When year (treatment) was insignificant, the *post hoc* test was conducted as a Dunnett's test comparing all post-treatment years (i.e., 2018 to 2022) to the pre-treatment year (2017).

^a MOD = (MCT_{After Treatment} - MCT_{Before Treatment})/MCT_{Before Treatment}*100, in which After Treatment combined all years (2018 to 2022), when Year (Treatment) was insignificant.

b MOD = (MCT_{after year} - MCT₂₀₁₇)/MCT₂₀₁₇*100 when Year (Treatment) was significant. MCT is the estimated marginal mean from the censored regression model.

Table F.31: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-1 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				SEA	Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	435	1,510	6,560	<2,045	<8,605	<485	7,280
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	0.110	<0.1	0.760	<0.41	<1.17	<0.21	1.23
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	0.0870	1.45	0.823	<5	<2.41	<7.41	1.54	4.94
Barium (Ba)	mg/kg	-	-	21.4	68.4	42.3	15.5	208	148	356	111	400
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.290	<0.2	0.280	<0.89	<1.17	<0.49	0.630
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	5.70
Cadmium (Cd)	mg/kg	0.600	3.50	< 0.05	0.442	0.858	0.126	<0.05	<1.48	<1.53	1.30	1.46
Calcium (Ca)	mg/kg	-	-	3,910	44,000	39,400	2,220	250	89,530	89,780	83,400	104,000
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	1.39	3.23	9.20	<10.1	<19.3	<6.39	11.4
Cobalt (Co)	mg/kg	-	-	0.250	1.81	3.58	1.39	1.50	7.03	8.53	5.39	8.92
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.680	12.6	9.93	<14.3	<24.2	<1.18	22.2
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	5,310	2,250	4,940	<7,660	<12,600	<5,360	11,500
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	5.64	0.720	3.90	<7.36	<11.3	<6.14	10.7
Lithium (Ĺi)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	7.20
Magnesium (Mg)	mg/kg	-	-	-	-	_	-	_	-	-	-	5,900
Manganese (Mn)	mg/kg	460	1,100	17.4	80.3	67.9	7.40	18.8	173	192	148	216
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0822
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	0.500	0.580	<2	<2.58	<1	1.54
Nickel (Ni)	mg/kg	16.0	75.0	1.63	13.4	29.9	11.8	6.40	56.7	63.1	43.3	64.5
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	52.0	-	-	<152	<152	<102	847
Potassium (K)	mg/kg	-	-	110	-	-	-	-	110	110	-	1,730
Selenium (Se) b	mg/kg	2.	00	0.610	0.200	5.36	49.8	16.6	56	72.6	5.56	80.9
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.300	<0.4	<0.7	<0.2	0.350
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	81.0
Strontium (Śr)	mg/kg	-	-	6.16	26.2	18.5	6.13	17.9	57	74.9	44.7	83.7
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	6,600
Thallium (TI)	mg/kg	-	-	< 0.05	<0.05	<0.05	<0.05	0.123	<0.2	< 0.323	<0.1	0.181
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	<1	15.9	<8	<23.9	<6	9.00
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	0.517	0.979	0.582	0.324	0.244	2.40	2.65	1.56	2.87
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	4.64	4.61	23.8	<9.65	<33.4	<4.84	26.6
Zinc (Zn)	mg/kg	123	315	<1	29.3	66.6	12.8	31.8	<110	<142	95.9	128

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.32: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-2 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				SE <i>A</i>	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	334	876	5,670	<1,310	<6,980	<384	5,120
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	0.13	<0.1	0.84	<0.43	<1.27	<0.23	1.11
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	0.121	0.626	0.365	<5	<1.16	<6.16	0.747	3.37
Barium (Ba)	mg/kg	-	-	9.14	49.8	60.9	22.3	105	142	247	111	259
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.22	<0.2	0.28	<0.82	<1.1	<0.42	0.46
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	<5
Cadmium (Cd)	mg/kg	0.600	3.50	< 0.05	0.335	0.797	0.11	<0.05	<1.29	<1.34	1.13	1.32
Calcium (Ca)	mg/kg	-	-	3,360	47,200	104,000	2,570	322	157,130	157,452	151,200	180,000
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	0.97	2.22	7.7	<8.69	<16.4	<5.97	8.18
Cobalt (Co)	mg/kg	-	-	0.18	1.09	2.74	0.98	1.64	4.99	6.63	3.83	6.85
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	<0.5	9.69	7.62	<11.2	<18.8	<1	17
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	2,300	1,210	5,030	<3,610	<8,640	<2,350	7,860
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	4.41	<0.5	2.76	<5.91	<8.67	<4.91	8.13
Lithium (Ĺi)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	5.3
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	5,620
Manganese (Mn)	mg/kg	460	1,100	13.2	63.2	59.4	6	20.6	142	162	123	176
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0628
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2.5	<1	1.15
Nickel (Ni)	mg/kg	16.0	75.0	1.96	11.9	30.5	10.9	6.5	55.3	61.8	42.4	64.4
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	68	-	-	<168	<168	<118	697
Potassium (K)	mg/kg	-	-	130	-	-	-	-	130	130	-	1,260
Selenium (Se) b	mg/kg	2.	00	1.66	0.8	9.58	51.9	12	63.9	75.9	10.4	76.2
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.24	<0.4	<0.64	<0.2	0.26
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	95
Strontium (Śr)	mg/kg	-	-	5.45	55.2	59.1	4.72	15.8	124	140	114	152
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	3,400
Thallium (TI)	mg/kg	-	-	< 0.05	< 0.05	< 0.05	<0.05	0.126	<0.2	< 0.326	<0.1	0.113
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	14.4	13.3	<21.4	<34.7	<6	7.4
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	0.426	1.6	1.4	0.288	0.221	3.71	3.94	3	4.16
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	2.71	3.41	20.4	<6.52	<26.9	<2.91	19.5
Zinc (Zn)	mg/kg	123	315	<1	17.6	59.4	7.6	34.5	<85.6	<120	77	106

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.33: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-3 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (AI)	mg/kg	-	-	<50.0	<50.0	660	1,830	8,690	<2,590	<11,280	<710	8,320
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.970	<0.4	<1.37	<0.2	1.25
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	<0.05	0.496	0.420	5.36	<1.02	<6.38	<0.546	6.30
Barium (Ba)	mg/kg	-	-	22.6	56.1	51.7	28.1	172	158	330	108	343
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.350	<0.2	0.430	<0.95	<1.38	<0.55	0.830
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	0.200
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	5.90
Cadmium (Cd)	mg/kg	0.600	3.50	0.180	0.531	0.530	0.101	0.0970	1.34	1.44	1.06	1.40
Calcium (Ca)	mg/kg	-	-	3,600	30,500	6,140	1,400	109	41,640	41,749	36,640	48,300
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.970	4.10	12.5	<10.6	<23.1	<5.97	13.5
Cobalt (Co)	mg/kg	-	-	0.390	1.32	5.73	1.12	3.39	8.56	12.0	7.05	11.3
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.930	9.69	18.4	<11.6	<30	<1.43	26.7
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,810	1,530	11,300	<5,440	<16,740	<3,860	14,500
Lead (Pb)	mg/kg	35.0	91.3	<0.5	0.590	4.59	1.04	7.98	<6.72	<14.7	5.18	13.7
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	5.80	<20	<25.8	<10	8.90
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	4,920
Manganese (Mn)	mg/kg	460	1,100	124	146	198	15.4	44.2	483	528	344	530
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.117
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	1.24	<2	<3.24	<1	1.68
Nickel (Ni)	mg/kg	16.0	75.0	1.99	10.9	31.7	10.4	14.3	55	69.3	42.6	66.6
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	114	-	-	<214	<214	<164	1,040
Potassium (K)	mg/kg	-	-	140	-	-	-	-	140	140	-	1,910
Selenium (Se) b	mg/kg	2.	00	0.310	<0.2	1.20	12.1	3.18	<13.8	<17	<1.4	16.8
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.140	<0.1	0.250	<0.44	<0.69	<0.24	0.450
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	66.0
Strontium (Sr)	mg/kg	-	-	5.61	15.8	6.54	4.86	23.4	32.8	56.2	22.3	59.0
Sulfur (S)	mg/kg	-	_	-	-	-	-	-		-	-	1,200
Thallium (TI)	mg/kg	-	_	< 0.05	<0.05	< 0.05	<0.05	0.152	<0.2	< 0.352	<0.1	0.146
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	_	<1	<5	<1	1.00	16.3	<8	<24.3	<6	10.5
Tungsten (W)	mg/kg	-	_	-	-	-	-	-		-	-	<0.5
Uranium (U)	mg/kg	-	-	0.0910	0.214	0.254	0.356	0.380	0.915	1.30	0.468	1.24
Vanadium (V)	mg/kg	-	_	<0.2	<0.2	3.88	5.54	33.5	<9.82	<43.3	<4.08	31.5
Zinc (Zn)	mg/kg	123	315	<1	17.7	55.3	11.6	77.6	<85.6	<163	73.0	138

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.34: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-4 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				S	EA Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	645	1,570	6,220	<2,315	<8,535	<695	7,180
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.820	<0.4	<1.22	<0.2	1.02
Arsenic (As)	mg/kg	5.90	17.0	0.0670	0.119	0.888	0.370	<5	1.44	<6.44	1.01	5.28
Barium (Ba)	mg/kg	-	-	22.9	52.6	40.1	22.3	136	138	274	92.7	294
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.380	<0.2	0.350	<0.98	<1.33	<0.58	0.700
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	5.60
Cadmium (Cd)	mg/kg	0.600	3.50	0.0920	0.536	0.500	0.0940	0.0700	1.22	1.29	1.04	1.16
Calcium (Ca)	mg/kg	-	-	3,160	37,400	5,700	1,040	85.0	47,300	47,385	43,100	55,700
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	1.03	3.59	9.30	<10.1	<19.4	<6.03	10.9
Cobalt (Co)	mg/kg	-	-	0.320	1.37	3.59	0.860	2.79	6.14	8.93	4.96	8.58
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.860	8.58	16.5	<10.4	<26.9	<1.36	23.5
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,870	1,360	8,520	<5,330	<13,850	<3,920	11,400
Lead (Pb)	mg/kg	35.0	91.3	<0.5	1.12	4.02	0.940	6.55	<6.58	<13.1	5.14	11.6
Lithium (Ĺi)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	7.80
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	-	-	-	-	4,440
Manganese (Mn)	mg/kg	460	1,100	37.3	70.1	56.2	7.30	36.9	171	208	126	215
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0933
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	1.02	<2	<3.02	<1	1.36
Nickel (Ni)	mg/kg	16.0	75.0	1.83	11.6	27.1	8.87	11.3	49.4	60.7	38.7	59.0
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	125	-	-	<225	<225	<175	964
Potassium (K)	mg/kg	-	-	160	-	-	-	-	160	160	-	1,730
Selenium (Se) b	mg/kg	2.	00	0.540	0.220	1.12	19.8	6.05	21.7	27.7	1.34	28.6
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	<0.1	<0.1	0.300	<0.4	<0.7	<0.2	0.390
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	65.0
Strontium (Śr)	mg/kg	-	-	4.60	17.8	6.52	3.86	19.9	32.8	52.7	24.3	58.8
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,800
Thallium (TI)	mg/kg	-	-	< 0.05	< 0.05	<0.05	<0.05	0.100	<0.2	< 0.3	<0.1	0.102
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	1.50	14.6	<8.5	<23.1	<6	8.60
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	0.173	0.364	0.256	0.307	0.320	1.10	1.42	0.620	1.42
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	3.87	5.00	25.9	<9.27	<35.2	<4.07	28.0
Zinc (Zn)	mg/kg	123	315	<1	23.9	43.9	9.20	61.1	<78.0	<139	67.8	117

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.35: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-5 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				SE	A Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	589	1,640	8,420	<2,329	<10,749	<639	8,840
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	1.05	<0.4	<1.45	<0.2	1.21
Arsenic (As)	mg/kg	5.90	17.0	< 0.05	0.0520	0.388	0.421	5.38	<0.911	<6.29	0.440	6.71
Barium (Ba)	mg/kg	-	-	18.8	57.4	45.4	32.1	164	154	318	103	346
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.360	<0.2	0.440	< 0.96	<1.4	<0.56	0.860
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	0.200
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	<5
Cadmium (Cd)	mg/kg	0.600	3.50	0.179	0.623	0.527	0.116	0.101	1.44	1.55	1.15	1.52
Calcium (Ca)	mg/kg	-	-	3,340	40,800	6,820	1,460	97.0	52,420	52,517	47,620	60,300
Chromium (Ćr)	mg/kg	37.3	90.0	<0.5	<5	0.970	3.61	12.5	<10.1	<22.6	<5.97	13.7
Cobalt (Co)	mg/kg	-	-	0.300	1.03	5.74	1.05	3.61	8.12	11.7	6.77	12.2
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.900	9.15	20.2	<11	<31.2	<1.4	29.9
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,460	1,330	11,100	<4,890	<15,990	<3,510	14,600
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	5.06	1.10	8.58	<7.16	<15.7	<5.56	14.7
Lithium (Ĺi)	mg/kg	-	-	<5	<5	<5	<5	5.30	<20	<25.3	<10	8.30
Magnesium (Mg)	mg/kg	-	-	-	-	-	-	_	-	-	-	4,880
Manganese (Mn)	mg/kg	460	1,100	134	177	250	18.9	47.5	580	627	427	671
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.111
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	1.41	<2	<3.41	<1	1.83
Nickel (Ni)	mg/kg	16.0	75.0	1.94	11.0	30.3	9.83	15.4	53.1	68.5	41.3	70.6
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	72.0	-	-	<172	<172	<122	1,040
Potassium (K)	mg/kg	-	-	130	-	-	-	=	130	130	-	2,140
Selenium (Se) b	mg/kg	2.	00	0.330	0.200	0.910	11.7	3.01	13.1	16.2	1.11	14.2
Silver (Ag)	mg/kg	0.500	-	<0.1	<0.1	0.130	<0.1	0.270	< 0.43	<0.7	<0.23	0.440
Sodium (Na)	mg/kg	-	-	<100	-	-	-	-	<100	<100	-	70.0
Strontium (Śr)	mg/kg	-	-	5.04	20.0	7.17	4.87	27.0	37.1	64.1	27.2	65.7
Sulfur (S)	mg/kg	-	-	-	-	-	-	-	-	-	-	1,200
Thallium (TI)	mg/kg	-	-	< 0.05	< 0.05	<0.05	<0.05	0.157	<0.2	< 0.357	<0.1	0.118
Tin (Sn)	mg/kg	-	-	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	-	-	<1	<5	<1	<1	15.3	<8	<23.3	<6	5.90
Tungsten (W)	mg/kg	-	-	-	-	-	-	-	-	-	-	<0.5
Uranium (Ù)	mg/kg	-	-	0.109	0.265	0.209	0.310	0.394	0.893	1.29	0.474	1.25
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	3.69	5.67	33.5	<9.76	<43.3	<3.89	34.4
Zinc (Zn)	mg/kg	123	315	<1	15.4	53.3	11.6	80.8	<81.3	<162	68.7	148

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

Table F.36: Results of Sequential Extraction Analysis (SEA) for Sediment Collected from RG_GHP-6 on Greenhills Creek Sedimentation Pond, September 2022

		BC W	SQG ^a				SI	EA Results				
Metal	Units	Lower	Upper	Fraction 1: Exchangeable and Adsorbed Metals	Fraction 2: Metals Bound to Carbonates	Fraction 3: Reducible Metals and Iron Oxides	Fraction 4: Metals Bound to Organic Material	Fraction 5: Residual Metals	Sum of Fractions 1 to 4	Sum of Fractions 1 to 5	Sum of Fractions 2 and 3	Conventional Bulk Metals Analysis
Aluminum (Al)	mg/kg	-	-	<50.0	<50.0	584	1,420	6,970	<2,104	<9,074	<634	7,720
Antimony (Sb)	mg/kg	-	-	<0.1	<0.1	<0.1	<0.1	0.790	<0.4	<1.19	<0.2	1.11
Arsenic (As)	mg/kg	5.90	17.0	<0.05	< 0.05	0.438	0.434	<5	< 0.972	<5.97	<0.488	5.77
Barium (Ba)	mg/kg	-	-	16.4	51.4	33.4	30.3	124	132	256	84.8	285
Beryllium (Be)	mg/kg	-	-	<0.2	<0.2	0.320	<0.2	0.390	< 0.92	<1.31	<0.52	0.810
Bismuth (Bi)	mg/kg	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.8	<1	<0.4	<0.2
Boron (B)	mg/kg	-	-	-	-	-	-	-	-	-	-	<5
Cadmium (Cd)	mg/kg	0.600	3.50	0.111	0.570	0.425	0.105	0.0720	1.21	1.28	0.995	1.30
Calcium (Ca)	mg/kg	-	-	2,960	44,200	8,950	1,280	90.0	57,390	57,480	53,150	72,000
Chromium (Cr)	mg/kg	37.3	90.0	<0.5	<5	0.940	3.07	10.2	<9.51	<19.7	<5.94	12.0
Cobalt (Co)	mg/kg	-	-	0.240	0.780	4.76	0.760	2.85	6.54	9.39	5.54	9.74
Copper (Cu)	mg/kg	35.7	197	<0.5	<0.5	0.720	7.79	17.0	<9.51	<26.5	<1.22	25.0
Iron (Fe)	mg/kg	21,200	43,766	<50.0	<50.0	3,450	1,140	8,550	<4,690	<13,240	<3,500	11,800
Lead (Pb)	mg/kg	35.0	91.3	<0.5	<0.5	4.62	0.950	6.35	<6.57	<12.9	<5.12	12.3
Lithium (Li)	mg/kg	-	-	<5	<5	<5	<5	<5	<20	<25	<10	7.80
Magnesium (Mg)	mg/kg	_	_	-	-	-	-	<u> </u>	-	-	-	4,500
Manganese (Mn)	mg/kg	460	1,100	124	141	228	13.4	39.0	506	545	369	585
Mercury (Hg)	mg/kg	0.170	0.486	-	-	-	-	-	-	-	-	0.0930
Molybdenum (Mo)	mg/kg	25.0	23,000	<0.5	<0.5	<0.5	<0.5	1.00	<2	<3	<1	1.59
Nickel (Ni)	mg/kg	16.0	75.0	2.31	12.0	30.8	8.24	11.7	53.4	65.0	42.8	67.4
Phosphorus (P)	mg/kg	-	-	<50.0	<50.0	100	-	-	<200	<200	<150	874
Potassium (K)	mg/kg		_	140	-	-	-	_	140	140	-	1,880
Selenium (Se) b	mg/kg	2	00	0.250	<0.2	0.620	6.80	1.67	<7.87	<9.54	<0.82	9.02
Silver (Ag)	mg/kg	0.500	_	<0.1	<0.1	0.110	<0.1	0.200	<0.41	<0.61	<0.21	0.400
Sodium (Na)	mg/kg	-	_	<100	-0.1	-	-	-	<100	<100	-0.21	69.0
Strontium (Sr)	mg/kg	_	_	4.20	19.6	8.17	4.23	23.7	36.2	59.9	27.8	67.7
Sulfur (S)	mg/kg	_	_	-	-	-	-	-	-	-	-	1,400
Thallium (TI)	mg/kg	_	_	<0.05	<0.05	<0.05	<0.05	0.0910	<0.2	<0.291	<0.1	0.0960
Tin (Sn)	mg/kg		_	<2	<2	<2	<2	<2	<8	<10	<4	<2
Titanium (Ti)	mg/kg	<u> </u>	-	<1	<5	<1	10.1	12.1	<17.1	<29.2	<6	6.70
Tungsten (W)	mg/kg		_	-	-	-	-	-	- 1111	-20.2	-	<0.5
Uranium (U)	mg/kg		_	0.0780	0.246	0.170	0.246	0.300	0.740	1.04	0.416	1.08
Vanadium (V)	mg/kg	-	-	<0.2	<0.2	3.54	5.12	27.8	<9.06	<36.9	<3.74	29.9
Zinc (Zn)	mg/kg	123	315	<1	16.7	51.6	9.80	65.4	<79.1	<144	68.3	128
<u> </u>	mg/ng	120	010	`1	10.1	01.0	5.00	00.7	1.0.1	7177	00.0	120

Concentration exceeds the upper BC WSQG or alert concentration for selenium.

Notes: BC WSQG = British Columbia Working Sediment Quality Guidelines; SEA = Sequential Extraction Analysis; mg/kg = milligrams per kilogram; - = no data/not applicable; < = less than; LRL = Laboratory Reporting Limit; BCMOECCS = British Columbia Ministry of Environment and Climate Change Strategy.

Values <LRL were replaced with the LRL in the calculation of the sum of fractions.

Fraction 1 - exchangeable and adsorbed metals that are released due to changes in ionic strength.

Fraction 2 - metals bound to carbonate that are released due to changes in pH.

Fraction 3 - easily reducible metals and iron oxides that are released under reducing conditions.

Fraction 4 - organic or mineral bound fractions that are released under oxidizing conditions.

^a BC WSQG for the protection of freshwater aquatic life (BCMOECCS 2021b).

^b The 2 mg/kg alert concentration from BCMOECCS (2021a) was applied; there is currently no BC WSQG for selenium.

## APPENDIX G BENTHIC INVERTEBRATE COMMUNITY

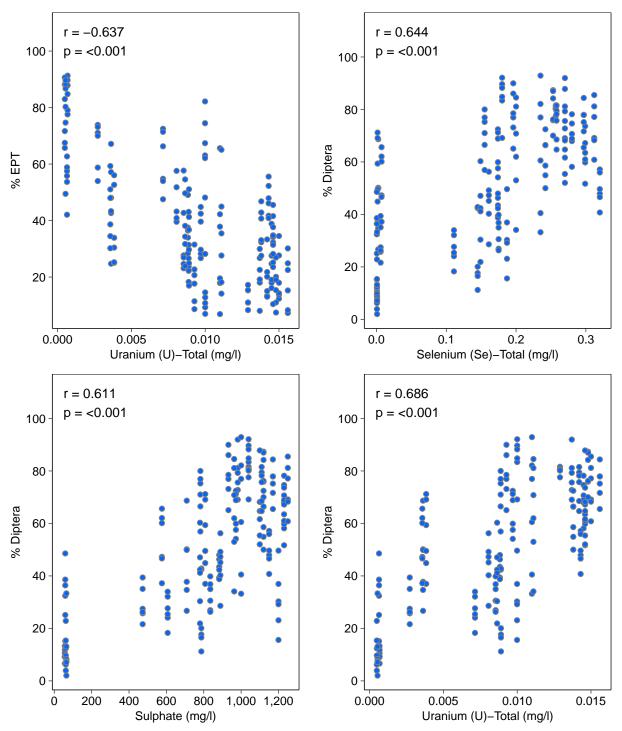


Figure G.1: Significant Spearman's Correlation Relationships ( $r \le -0.6$  or  $r \ge 0.6$ ) Between Benthic Invertebrate Community Endpoints and Water Chemistry Constituents with Early Warning Triggers, Greenhills and Gardine Creeks, 2017 to 2022

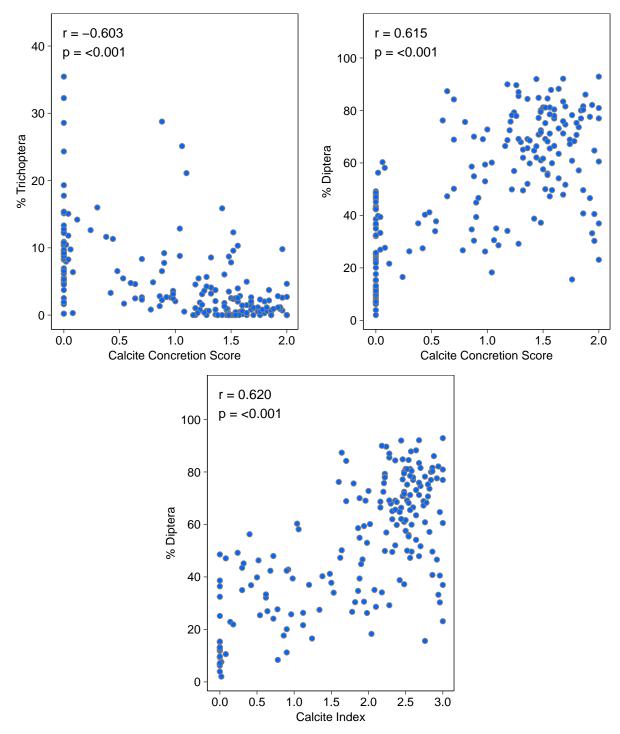


Figure G.2: Significant Spearman's Correlation Relationships ( $r \le -0.6$  or  $r \ge 0.6$ ) Between Benthic Invertebrate Community Endpoints and Calcite Index and Concretion Scores, Greenhills and Gardine Creeks, 2017 to 2022

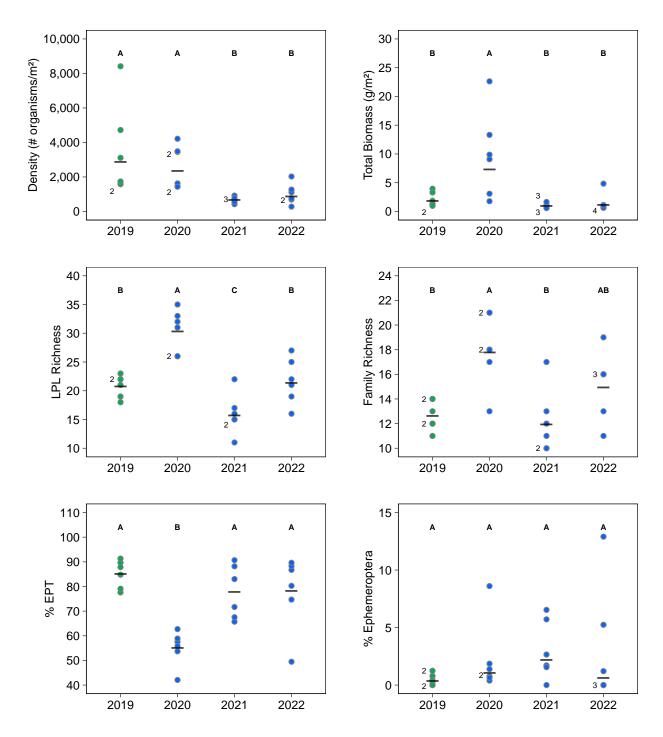


Figure G.3: Benthic Invertebrate Community Endpoint Comparisons for Upper Gardine Creek (RG_GAUT), September 2019 to 2022

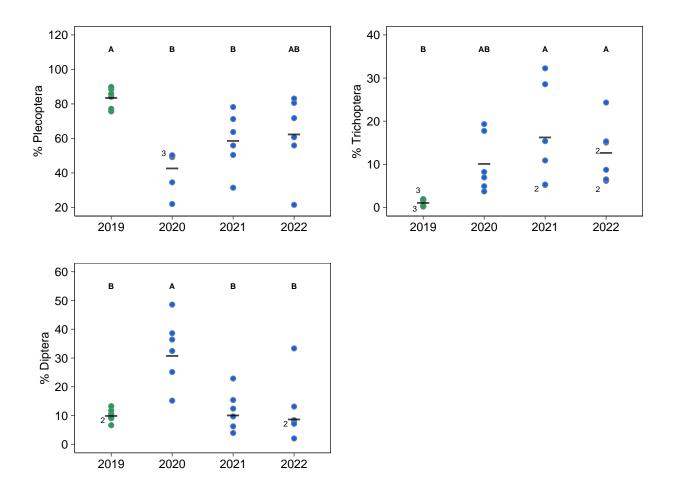


Figure G.3: Benthic Invertebrate Community Endpoint Comparisons for Upper Gardine Creek (RG_GAUT), September 2019 to 2022

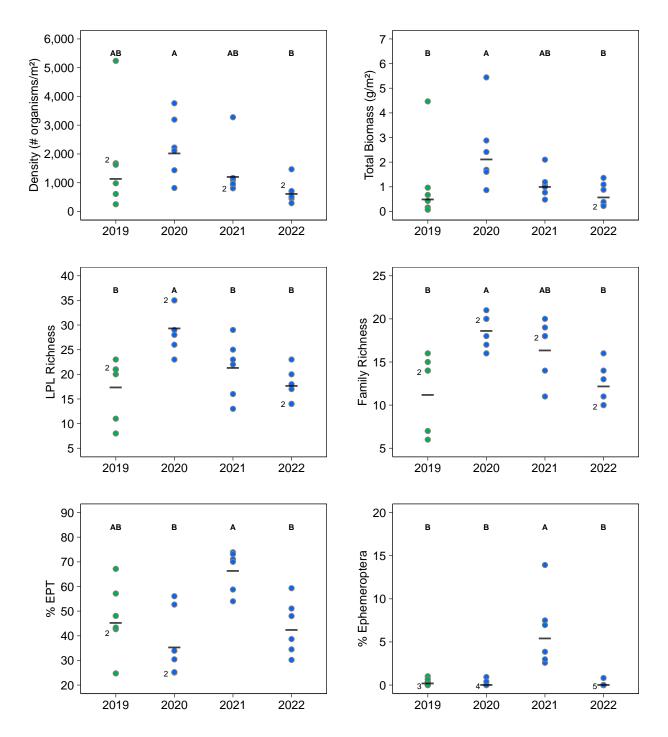


Figure G.4: Benthic Invertebrate Community Endpoint Comparisons for Lower Gardine Creek (RG_GANF), September 2019 to 2022

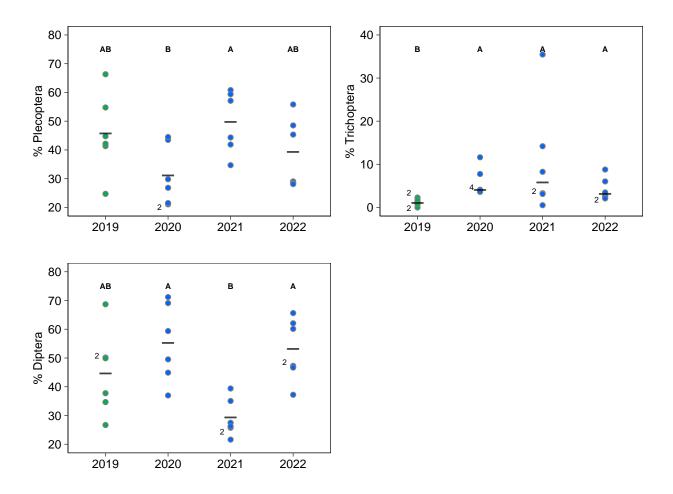


Figure G.4: Benthic Invertebrate Community Endpoint Comparisons for Lower Gardine Creek (RG_GANF), September 2019 to 2022

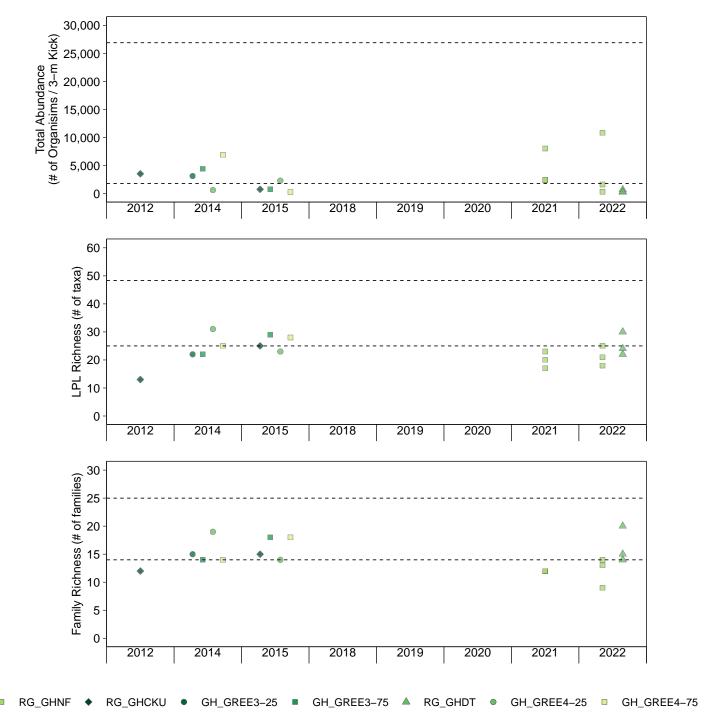


Figure G.5: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Upper Greenhills Creek, September 2012 to 2022

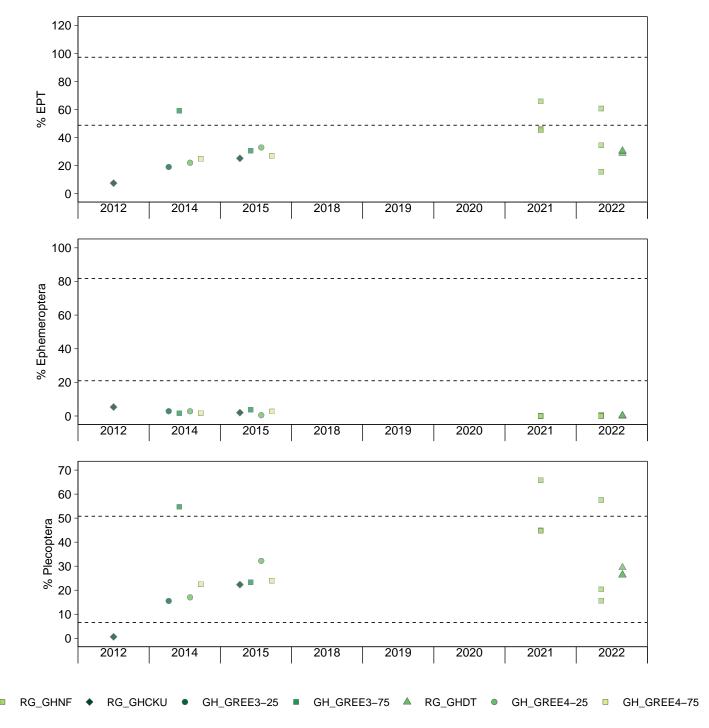


Figure G.5: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Upper Greenhills Creek, September 2012 to 2022

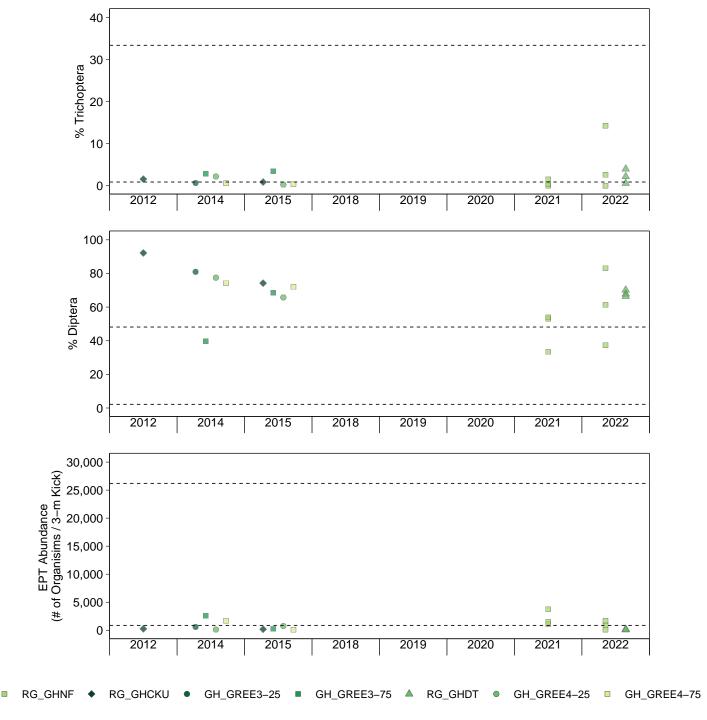


Figure G.5: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Upper Greenhills Creek, September 2012 to 2022

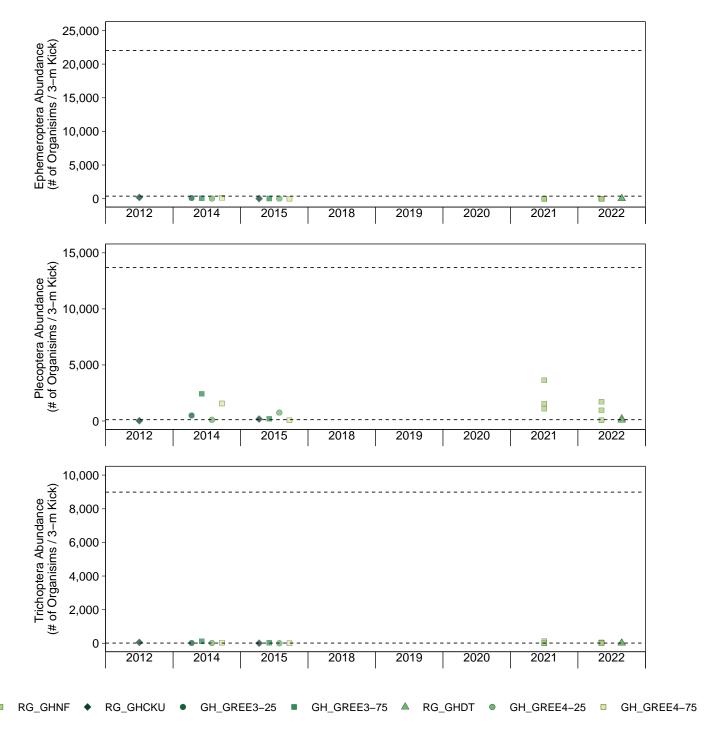
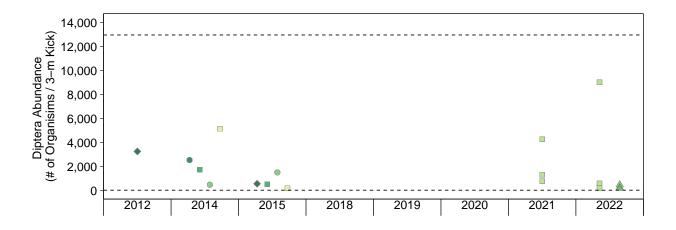


Figure G.5: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Upper Greenhills Creek, September 2012 to 2022



■ RG_GHNF ◆ RG_GHCKU • GH_GREE3-25 ■ GH_GREE3-75 ▲ RG_GHDT • GH_GREE4-25 ■ GH_GREE4-75

Figure G.5: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Upper Greenhills Creek, September 2012 to 2022

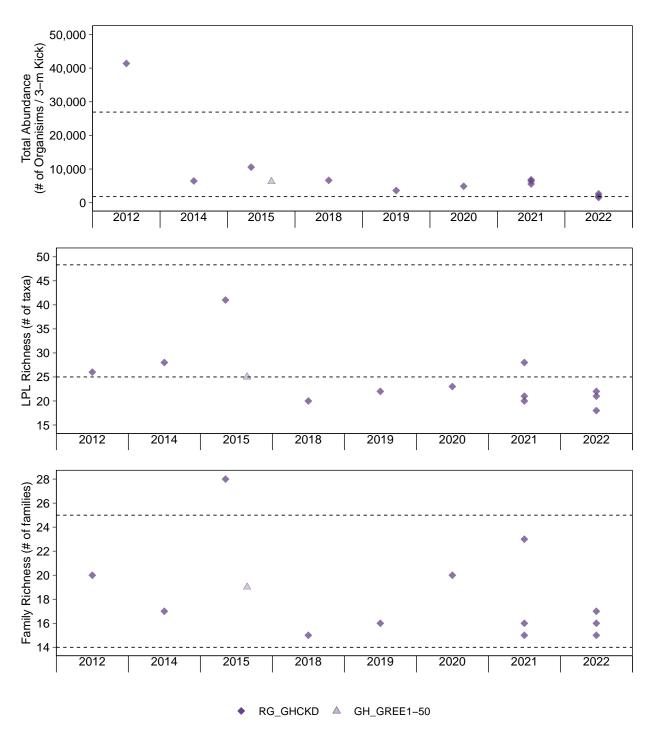


Figure G.6: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Lower Greenhills Creek, September 2012 to 2022

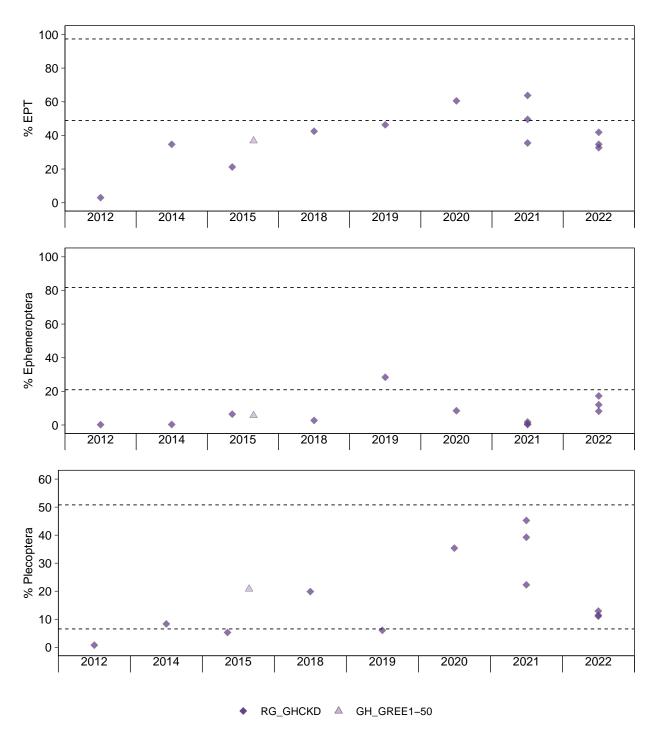


Figure G.6: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Lower Greenhills Creek, September 2012 to 2022

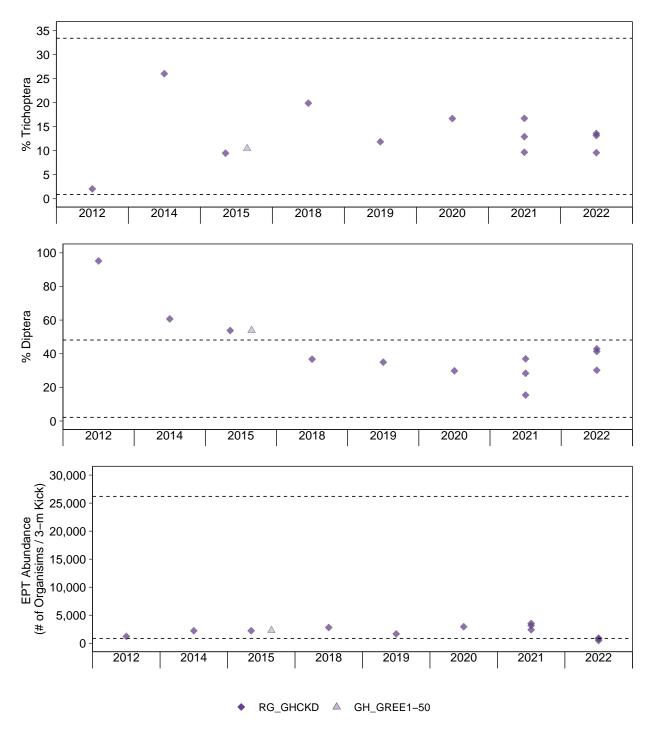


Figure G.6: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Lower Greenhills Creek, September 2012 to 2022

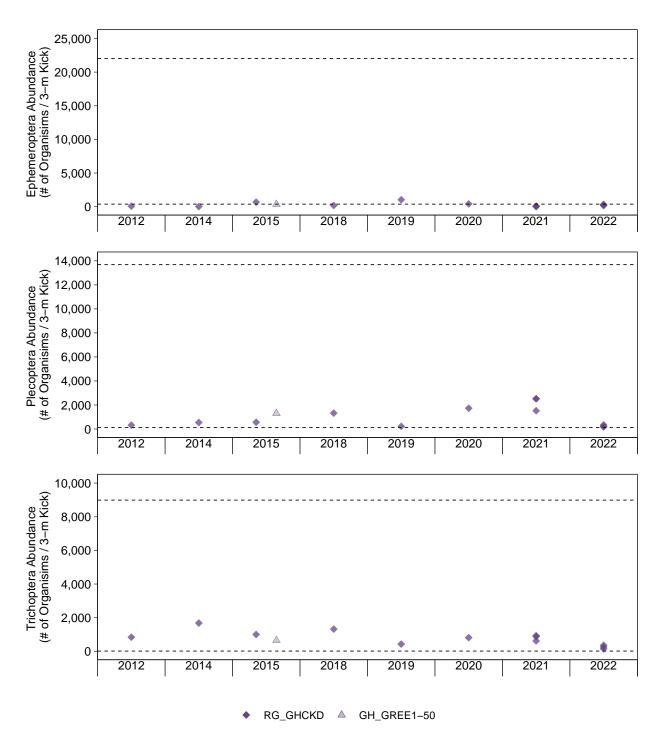
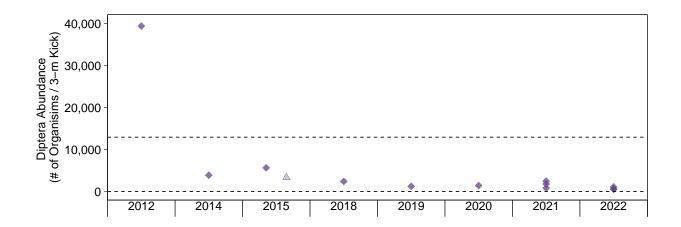


Figure G.6: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Lower Greenhills Creek, September 2012 to 2022



◆ RG_GHCKD △ GH_GREE1-50

Figure G.6: Benthic Invertebrate Community Endpoints for Timed Kick Samples on Lower Greenhills Creek, September 2012 to 2022

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse				Gardin	e Creek			
Biological Area Code				RG_0	GAUT			
Station ID		RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	
Date Sampled		14-Sep-22	14-Sep-22	14-Sep-22	14-Sep-22	14-Sep-22	14-Sep-22	
Weather				Hazy (	smoke)			
Air Temperature (°C)	T				<u>-</u>	T		
UTMs (NAD83, Zone	Easting	653457	653435	653402	653384	653347	653320	
11U)	Northing	5548920	5548949	5548985	5548987	5549025	5549046	
Habitat Characteristic	S	1						
Surrounding Land Use				0. 00	ed historically			
Length of Reach Asses	sed (m)		T	10	00			
Water Temperature (°C	5)	6.3	7.0	7.5	8.5	8.8	9.1	
pН		7.79	7.79	7.98	8.06	8.04	8.24	
Dissalved Ovygen	% sat	78.2	80.1	79.2	79.6	78.3	80.4	
Dissolved Oxygen	mg/L	9.64	9.71	9.48	9.30	9.09	9.25	
Specific Conductance (	μS/cm)	485	491	488	484	490	488	
Water Clarity				Cl	ear			
Water Colour				Colo	urless			
Wetted width (m)		0.90	0.84	0.78	0.63	0.55	0.37	
Bankfull width (m)		3.1	2.2	1.8	2.5	3.3	2.1	
Average W			0	.3				
Average Wa	ter Velocity (m/s)	0.019	0.058	0.026	0.040	0.042	0.094	
	% Bedrock			(	)			
	% Boulder			1	0			
	% Cobble			3	0			
Substrate	% Gravel			2	10			
	% Sand			4	.0			
	% Fines			(	)			
	Canopy Coverage (%)			76 to	100			
	Streamside Vegetation				_			
	Dominant Vegetation			Deciduo	ous trees			
Vegetation	Macrophyte Coverage (%)			(	)			
	-							
		1 - Rocks not s	slippery, no ob	vious colour (<	<0.5 mm thick)			
Benthic Invertebrate S	to 5) Sampling ^a	1						
Number of Jars	1	1	1	1	1	1		
Macrophytes (in sampler)	N	N	N	N	N	N		
Algae (in sampler)		N	N	N	N	N	N	
Comments				,	_	1		

Notes: ID = identifier; - = no data/not recorded; °C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre; % sat = percent saturation; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse; µm = micrometre; m ² = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse				Gardin	e Creek		
Biological Area Code				RG_0	GANF		
Station ID		RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Date Sampled		13-Sep-22	13-Sep-22	13-Sep-22	13-Sep-22	13-Sep-22	13-Sep-22
Weather					-		
Air Temperature (°C)	T		T		-	T	
UTMs (NAD83, Zone	Easting	654273	654256	654235	654200	654184	654130
11U)	Northing	5547738	5547799	5547802	5547815	5547836	5547824
Habitat Characteristic	<b>S</b>	Г					
Surrounding Land Use				Mir	ning		
Length of Reach Asses	sed (m)		1	10	00	1	
Water Temperature (°C	)	6.9	8.0	8.4	8.8	9.0	9.3
рН		7.94	8.01	8.04	8.06	8.01	8.01
D: 1 0	% sat	83.0	82.5	83.9	83.9	83.9	84.0
Dissolved Oxygen	mg/L	10.07	9.79	9.79	9.69	9.64	9.60
Specific Conductance (	μS/cm)	1,339	1,720	1,747	1,745	1,747	1,751
Water Clarity	· · · · · · · · · · · · · · · · · · ·				_		
Water Colour					_		
Wetted width (m)		2.4	1.6	1.4	1.6	1.9	2.3
Bankfull width (m)		3.2	3.6	4.6	5.6	3.5	3.4
` ,	ater Depth (m)						
<u> </u>	ter Velocity (m/s)	0.124	0.108	0.046	0.202	0.127	0.207
	% Bedrock				_	_	
	% Boulder				_		
	% Cobble				_		
Substrate	% Gravel				_		
	% Sand				-		
	% Fines				- -		
					<u>-</u>		
	Canopy Coverage (%)						
	Streamside Vegetation				=		
Vegetation	Dominant Vegetation  Macrophyte Coverage				-		
_	(%)						
	Dominant Macrophyte				-		
	Periphyton Coverage (1 to 5)				_		
Benthic Invertebrate S	Sampling ^a						
Number of Jars		1	1	1	1	1	1
Macrophytes (in sampler)		N	N	N	N	N	N
Algae (in sampler)		N	N	N	N	N	N
Comments			•		-	•	

Notes: ID = identifier; - = no data/not recorded;  $^{\circ}$ C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre; % sat = percent saturation; mg/L = milligrams per litre;  $\mu$ S/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse;  $\mu$ m = micrometre; m  2  = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse				Upper Gree	nhills Creek		
Biological Area Code					GHUT		
Station ID		RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6
Date Sampled		15-Sep-22	15-Sep-22	15-Sep-22	15-Sep-22	15-Sep-22	15-Sep-22
Weather					cloudy		
Air Temperature (°C)	- v	054447	054444		7	054404	054400
UTMs (NAD83, Zone 11U)	Easting	654147	654144	654128	654136	654131	654136
	Northing	5549851	5549894	5549931	5549960	5549994	5550024
Habitat Characteristic	S	1		Miningulaga	ad biotovically		
Surrounding Land Use	17.				ed historically		
Length of Reach Asses	` '		I		00	1	
Water Temperature (°C	5)	4.8	4.9	5.0	5.3	5.5	5.8
рН		7.89	7.92	7.94	7.91	7.90	7.92
Dissolved Oxygen	% sat	81.6	82.2	82.8	83.6	84.6	86.6
2.5001104 Oxygon	mg/L	10.41	10.45	10.49	10.51	10.59	10.75
Specific Conductance (	μS/cm)	2,203	2,290	2,299	2,300	2,315	2,324
Water Clarity				Turbid from ov	ernight rainfal	ĺ	
Water Colour				Bro	own		
Wetted width (m)		2.1	2.6	2.2	1.7	2.9	1.4
Bankfull width (m)		9.1	10.2	3.4	3.9	6.3	4.4
Average W	/ater Depth (m)			0	.3		
Average Wa	ter Velocity (m/s)	0.150	0.316	0.315	0.204	0.215	0.303
	% Bedrock		l.	l .	-		
	% Boulder				•		
	% Cobble				•		
Substrate	% Gravel				_		
	% Sand				_		
	% Fines				_		
	Canopy Coverage (%)			1 to	25		
	Streamside Vegetation		Ferns	/grass equally	dominant as s	hrubs.	
	Dominant Vegetation				/grass		
Vegetation	Macrophyte Coverage (%)				)		
	Dominant Macrophyte				•		
	Periphyton Coverage (1 to 5)	4 -	Rocks are very	/ slippery, num	erous clumps	(5 to 20 mm th	ick)
Benthic Invertebrate \$	·	1					
Number of Jars	. <b>U</b>	1	1	1	1	2	2
Macrophytes (in sampler)		N	N	N	N	N	N
Algae (in sampler)		C C C SP SP N					
Comments		Mo	stly pavement	. Can't discern	substrate. Lar	ge algae stran	ds.

Notes: ID = identifier; - = no data/not recorded; °C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre; % sat = percent saturation; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse; µm = micrometre; m ² = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Biological Area Code Station ID  Date Sampled Weather Air Temperature (°C) UTMs (NAD83, Zone 11U)  Habitat Characteristics Surrounding Land Use Length of Reach Assessed (m) Water Temperature (°C) pH  Dissolved Oxygen  Water Colour Wetred width (m) Bankfull width (m)  Average Water Depth (m) Average Water Velocity (m/ % Band % Fines Canopy Cov Streamside in Dominant Velocity (Market Canopy Cov		FG_GHNF-1 9-Sep-22 654388 5548985 5.6 7.53 81.2 10.14 1,936	654374 5549036 6.8 7.84 81.2 9.84 1.932	RG_GHNF-3 10-Sep-22 Sui 654367 5549044  Mining; logge 10 3.3 - 83.0	RG_GHNF-4 10-Sep-22 nny 6 654344 5549094	RG_GHNF-5 10-Sep-22 654337 5549155	RG_GHNF-6 10-Sep-22 654306 5549188
Date Sampled Weather Air Temperature (°C) UTMs (NAD83, Zone 11U) Northing Habitat Characteristics Surrounding Land Use Length of Reach Assessed (m) Water Temperature (°C) pH Dissolved Oxygen Specific Conductance (μS/cm) Water Clarity Water Colour Wetted width (m) Bankfull width (m) Average Water Depth (m) Average Water Velocity (m/ % Bedrock % Boulder % Cabble % Gravel % Sand % Fines Canopy Cov Streamside		9-Sep-22 654388 5548985 5.6 7.53 81.2 10.14	9-Sep-22 654374 5549036 6.8 7.84 81.2 9.84	10-Sep-22 Sun 1 654367 5549044 Mining; logge 10 3.3 - 83.0	10-Sep-22 nny 6 6 654344 5549094 ed historically 00 3.7	10-Sep-22 654337 5549155	10-Sep-22 654306 5549188
Weather Air Temperature (°C) UTMs (NAD83, Zone 11U) Habitat Characteristics Surrounding Land Use Length of Reach Assessed (m) Water Temperature (°C) pH Dissolved Oxygen Water Colour Wetred width (m) Bankfull width (m) Average Water Depth (m) Average Water Velocity (m/ % Baulder % Gravel % Sand % Fines Canopy Cov Streamside		5.6 7.53 81.2 10.14	654374 5549036 6.8 7.84 81.2 9.84	Sun 1 654367 5549044 Mining; logger 10 3.3 - 83.0	6 654344 5549094 ed historically 00 3.7	654337 5549155	654306 5549188
Air Temperature (°C)  UTMs (NAD83, Zone 11U)  Habitat Characteristics  Surrounding Land Use  Length of Reach Assessed (m)  Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Average Water Depth (m)  Average Water Velocity (m/  Substrate  Substrate  Substrate  Canopy Cov  Streamside: Dominant Velocitists		5.6 7.53 81.2 10.14	6.8 7.84 81.2 9.84	1 654367 5549044 Mining; logge 10 3.3 - 83.0	6 654344 5549094 ed historically 00 3.7	5549155	5549188
UTMs (NAD83, Zone 11U)  Habitat Characteristics  Surrounding Land Use  Length of Reach Assessed (m)  Water Temperature (°C)  pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Average Water Depth (m)  Average Water Velocity (m/  % Badrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside		5.6 7.53 81.2 10.14	6.8 7.84 81.2 9.84	654367 5549044 Mining; logge 10 3.3 - 83.0	654344 5549094 ed historically 00 3.7	5549155	5549188
11U) Northing  Habitat Characteristics  Surrounding Land Use  Length of Reach Assessed (m)  Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  % Bedrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside		5.6 7.53 81.2 10.14	6.8 7.84 81.2 9.84	5549044  Mining; logge 10 3.3 - 83.0	5549094 ed historically 00 3.7	5549155	5549188
Habitat Characteristics  Surrounding Land Use  Length of Reach Assessed (m)  Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Average Water Depth (m)  Average Water Velocity (m/  % Bedrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside: Dominant Ve		5.6 7.53 81.2 10.14	6.8 7.84 81.2 9.84	Mining; logge 10 3.3 - 83.0	ed historically 00 3.7		
Surrounding Land Use  Length of Reach Assessed (m)  Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Substrate  Substrate  Substrate  Substrate  Canopy Cov  Streamside Dominant Velocity  Wetted Water Colour  Streamside Colominate Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/  Streamside Colominant Velocity (m/		7.53 81.2 10.14	7.84 81.2 9.84	3.3 - 83.0	3.7	4.5	6.6
Length of Reach Assessed (m)  Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Average Water Depth (m)  Average Water Velocity (m/  % Bedrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside: Dominant Velocity		7.53 81.2 10.14	7.84 81.2 9.84	3.3 - 83.0	3.7	4.5	6.6
Water Temperature (°C) pH  Dissolved Oxygen  Specific Conductance (µS/cm) Water Clarity Water Colour Wetted width (m) Bankfull width (m)  Average Water Depth (m) Average Water Velocity (m/ % Bedrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside		7.53 81.2 10.14	7.84 81.2 9.84	3.3 - 83.0	3.7	4.5	6.6
pH  Dissolved Oxygen  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Baukfull width (m)  Substrate  Substrate  Substrate  Canopy Cov  Streamside Dominant Velocity  Specific Conductance (µS/cm)  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Clarity  Water Cla		7.53 81.2 10.14	7.84 81.2 9.84	83.0	-	4.5	6.6
Dissolved Oxygen    % sat   mg/L     Specific Conductance (µS/cm)     Water Clarity     Water Colour     Wetted width (m)     Bankfull width (m)     Average Water Depth (m)     Average Water Velocity (m/ % Bedrock % Boulder % Gravel % Sand % Fines     Canopy Cov     Streamside     Dominant Velocities     Dominant Velocities     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate   mg/L     % Sate		81.2 10.14	81.2 9.84		- 83 Q	-	
Dissolved Oxygen mg/L  Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  % Bedrock % Boulder % Cobble % Gravel % Sand % Fines  Canopy Cov Streamside		10.14	9.84		83.0		_
mg/L     Specific Conductance (μS/cm)     Water Clarity     Water Colour     Wetted width (m)     Bankfull width (m)     Average Water Depth (m)     Average Water Velocity (m/width of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour of the colour				11.00	00.0	83.4	84.3
Specific Conductance (µS/cm)  Water Clarity  Water Colour  Wetted width (m)  Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Bedrock  Bedrock  Boulder  Cobble  Gravel  Sand  Fines  Canopy Cov  Streamside  Dominant Velocity  Company Cov				11.02	11.00	10.72	10.27
Water Clarity Water Colour Wetted width (m) Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Bedrock Bedrock Boulder Cobble Gravel Sand Fines Canopy Cov Streamside		1,222		1,983	1,986	1.977	1,980
Water Colour Wetted width (m) Bankfull width (m)  Average Water Depth (m) Average Water Velocity (m/  Bedrock Bedrock Boulder Cobble Gravel Sand Fines Canopy Cov Streamside			,	, ,	ear	.,	.,
Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Bedrock  Boulder  Cobble  Gravel  Sand  Fines  Canopy Cov  Streamside  Dominant Ve				Colou			
Bankfull width (m)  Average Water Depth (m)  Average Water Velocity (m/  Bedrock  Boulder  Cobble  Gravel  Sand  Fines  Canopy Cov  Streamside  Dominant Ve		2.7	1.9	2.8	5.7	10.0	4.2
Average Water Depth (m)  Average Water Velocity (m/   Bedrock  Boulder  Cobble  Gravel  Sand  Fines  Canopy Cov  Streamside  Dominant Velocity (m/  Bedrock  Section (m/  Bedrock  Streamside  Dominant Velocity  Streamside		4.5	4.2	4.6	8.1	12.8	6.5
Average Water Velocity (m/	\	7.0	7.2	0.		12.0	0.0
% Bedrock % Boulder % Cobble % Gravel % Sand % Fines Canopy Cov Streamside Dominant Ve	,	0.078	0.063	0.046	0.206	0.099	0.291
% Boulder % Cobble % Gravel % Sand % Fines Canopy Cov Streamside Dominant Ve	3)	0.076	0.003		0.200	0.099	0.291
Substrate  % Cobble % Gravel % Sand % Fines Canopy Cov Streamside Dominant Ve							
Substrate % Gravel % Sand % Fines Canopy Cov Streamside Dominant Ve					0		
% Sand % Fines Canopy Cov Streamside Dominant Ve					0		
% Fines Canopy Cov Streamside Dominant Ve					)		
Canopy Cov Streamside Dominant Ve				(	)		
Streamside Dominant Vo				1	0		
Dominant Ve	/erage (%)			51 to	o 75		
	Vegetation		Equal mixtu	ire of coniferou	ıs, deciduous,	and shrubs	
	egetation				-		
Vegetation Macrophyte (%)	Coverage			(	)		
Dominant M	acrophyte			-	-		
Periphyton ( to 5)	Coverage (1	5 - Rocks r	mostly obscure	d by algae ma	t, may have lor	ng strands (>20	Omm thick)
Benthic Invertebrate Sampling ^a							
Number of Jars		1	1	1	2	2	3
Macrophytes (in sampler)	İ	N	N	N	N	N	N
Algae (in sampler)		C N N C C C					
Comments		С	1	pH probe ma		l .	

Notes: ID = identifier; - = no data/not recorded;  $^{\circ}$ C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre;  $^{\circ}$ S at = percent saturation; mg/L = milligrams per litre;  $^{\circ}$ LS/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse;  $^{\circ}$ m = micrometre; m  $^{\circ}$  = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse				Upper Gree	nhills Creek		
Biological Area Code					GHDT		
Station ID		RG_GHDT-1	RG_GHDT-2	RG_GHDT-3	RG_GHDT-4	RG_GHDT-5	RG_GHDT-6
Date Sampled		16-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
Weather					ıd, smoke		
Air Temperature (°C)	T				6		
UTMs (NAD83, Zone	Easting	654288	654310	654342	654356	654359	654357
11U)	Northing	5547720	5547725	5547758	5547815	5547831	5547848
Habitat Characteristics	S	ı					
Surrounding Land Use				Mir	ning		
Length of Reach Assess	sed (m)		T	10	00	1	T
Water Temperature (°C)	)	5.2	5.4	5.5	5.6	5.7	6.0
рН		8.20	8.19	8.21	8.15	8.16	8.16
Diagolary Communi	% sat	84.1	84.7	84.5	84.5	84.8	84.8
Dissolved Oxygen	mg/L	10.60	10.63	10.59	10.57	10.57	10.49
Specific Conductance (բ	uS/cm)	2,034	2,044	2,047	2,049	2,051	2,048
Water Clarity				Cle	ear		
Water Colour				Color	ırless		
Wetted width (m)		3.8	4.5	3.3	3.8	2.3	3.8
Bankfull width (m)		6.7	8.8	8.2	7.7	6.0	10.3
Average W	ater Depth (m)			0	.3		
	er Velocity (m/s)	0.053	0.214	0.043	0.142	0.219	0.191
	% Bedrock			(	)		
	% Boulder			1	0		
	% Cobble				5		
Substrate	% Gravel				5		
	% Sand				-		
	% Fines				-		
	Canopy Coverage (%)			51 to	o 75		
	Streamside Vegetation				- · <b>~</b> -		
	Dominant Vegetation			Shr	ubs		
Vegetation	Macrophyte Coverage (%)				)		
	Dominant Macrophyte				=		
	Periphyton Coverage (1 to 5)	2 - Rocks	slightly slipper			n colour (0.5-1	mm thick)
Benthic Invertebrate S	,	<u> </u>					
Number of Jars	-unpinig	1	1	1	1	1	1
Macrophytes (in sampler)		N	N	N	N	N	N
Algae (in sampler)		N	N	N	N	N	N
Comments			te terraces (he				

Notes: ID = identifier; - = no data/not recorded;  $^{\circ}$ C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre; % sat = percent saturation; mg/L = milligrams per litre;  $\mu$ S/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse;  $\mu$ m = micrometre; m  2  = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse		Upper Greenhills Creek											
Biological Area Code		RG_GHFF RG_GHFF-1 RG_GHFF-2 RG_GHFF-3 RG_GHFF-4 RG_GHFF-5 RG_GH											
Station ID		RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6						
Date Sampled		8-Sep-22	8-Sep-22	9-Sep-22	9-Sep-22	9-Sep-22	9-Sep-22						
Weather					ow overnight								
Air Temperature (°C)	le «	054445	054444		0	054400	054404						
UTMs (NAD83, Zone 11U)	Easting	654115	654111	654143	654161	654183	654184						
Habitat Characteristic	Northing	5547122	5547139	5547195	5547200	5547260	5547288						
Surrounding Land Use	.5	Mining											
Length of Reach Asses	and (m)	Mining 100											
	. ,	0.7	7.0			<b>50</b>	<b>5</b> 0						
Water Temperature (°C	·)	6.7	7.2	7.1	5.0	5.0	5.2						
рН		7.51	7.55	7.56	7.66	7.58	7.60						
Dissolved Oxygen	% sat	83.1	84.0	84.4	83.7	84.5	84.3						
	mg/L	10.12	10.10	10.15	10.63	10.73	10.67						
Specific Conductance (	μS/cm)	1,592	1,601	1,614	1,593	1,594	1,593						
Water Clarity		Clear											
Water Colour			Colourless										
Wetted width (m)		5.3	4.1	2.9	3.1	3.6	8.0						
Bankfull width (m)		6.9	6.1	7.7	4.0	4.2	9.3						
Average W	/ater Depth (m)			0	.3								
Average Wa	ter Velocity (m/s)	0.221	0.221 0.224 0.121 0.279 0.296 0.2										
	% Bedrock				0								
	% Boulder	70											
	% Cobble			25									
Substrate	% Gravel	0											
	% Sand			(	0								
	% Fines	5											
	Canopy Coverage (%)			26 t	o 50								
	Streamside Vegetation				<b>-</b>								
	Dominant Vegetation			Ferns	/grass								
Vegetation	Macrophyte Coverage (%)				0								
	Dominant Macrophyte				-								
	Periphyton Coverage (1 to 5)		1 - Rocks not s	slippery, no ob	vious colour (<	<0.5 mm thick)							
Benthic Invertebrate S		!											
Number of Jars	<u>v</u>	1	1	1	1	1	1						
Macrophytes (in sampler)		N	N	N	N	N	N						
Algae (in sampler)		N	N	N	N	N	N						
Comments			Ш	Heavily	calcified.	Ш	I.						

Notes: ID = identifier; - = no data/not recorded;  $^{\circ}$ C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre;  $^{\circ}$ S at = percent saturation; mg/L = milligrams per litre;  $^{\circ}$ B/Cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse;  $^{\circ}$ m = micrometre; m  $^{\circ}$  = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.1: Supporting Measures Associated with Area-based and Timed Kick and Sweep Benthic Invertebrate Community Sampling, September 2022

Watercourse		Lower Greenhills Creek												
Biological Area Code		RG_GHBP												
Station ID		RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6							
Date Sampled		10-Sep-22	12-Sep-22	12-Sep-22	12-Sep-22	12-Sep-22	12-Sep-22							
Weather					cloud									
Air Temperature (°C)	Te	050505	050545	1	8	050554	050505							
UTMs (NAD83, Zone 11U)	Easting	653505	653515	653524	653534	653554	653527							
	Northing	5545599	5545625	5545635	5545655	5545676	5545693							
Habitat Characteristics	<u> </u>	Mining.												
Surrounding Land Use		Mining												
Length of Reach Assess	sed (m)	100												
Water Temperature (°C)	)	12.4	12.6	12.8	13.1	13.4	13.6							
рН		7.92	8.34	8.23	-	-	-							
D: 1 10	% sat	82.9	84.1	84.4	84.0	85.3	84.9							
Dissolved Oxygen	mg/L	8.82	8.91	8.89	8.80	8.86	8.78							
Specific Conductance (μ	uS/cm)	1,482	1,482	1,482	1,482	1,480	1,478							
Water Clarity	·	Clear												
Water Colour		Colourless												
Wetted width (m)		5.1	2.3	2.7	6.5	3.7	2.8							
Bankfull width (m)		10.5	3.6	5.3	9.6	8.6	5.9							
. ,	ater Depth (m)				.3									
	er Velocity (m/s)	0.339	0.306	0.141	0.051	0.227	0.202							
J	% Bedrock	0.339 0.306 0.141 0.051 0.227 0.202												
	% Boulder	10												
	% Cobble				5									
Substrate	% Gravel													
	% Sand				0									
					5									
	% Fines													
	Canopy Coverage (%)				25	. ,								
	Streamside Vegetation		Equal mixtu	re of deciduou	•	terns/grass								
	Dominant Vegetation			Deciduo	us trees									
Vegetation	Macrophyte Coverage (%)			(	0									
	Dominant Macrophyte				-									
	Periphyton Coverage (1 to 5)	2 - Rocks s	slightly slippery	, yellow-brown	to light green	colour (0.5 to 1	mm thick)							
Benthic Invertebrate S	ampling ^a													
Number of Jars	-	1	1	1	1	1	1							
Macrophytes (in sampler)	N	N	N	N	N	N								
Algae (in sampler)		N	N	N	N	N	N							
Comments		pH probe malfunctioned.												

Notes: ID = identifier; - = no data/not recorded;  $^{\circ}$ C = degrees Celsius; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; m = metre; % sat = percent saturation; mg/L = milligrams per litre;  $\mu$ S/cm = microSiemens per centimetre; m/s = metres per second; < = less than; mm = millimetres; > = greater than; N = none; C = common; SP = sparse;  $\mu$ m = micrometre; m² = square metre; CABIN = Canadian Aquatic Biomonitoring Network.

^a Data are for area-based kicks unless otherwise indicated. A kick net with a 400 μm mesh was used to kick an estimated sampling area of 1/3 m² at each station listed in the table. A kick net with a 400 μm mesh was also used to collect the timed CABIN samples from RG_GHNF (n = 3) and RG_GHDT (n = 3).

Table G.2: Summary of Benthic Invertebrate Endpoints Collected by Area-based (1/3 m²) Kick and Sweep Sampling at Greenhills and Gardine Creeks, September 2022

Watercourse	Biological Area Code	Replicate	Density (No. org/m²)	Biomass (g/m²)	LPL Richness (No. of taxa)	Family Richness	%EPT	%Ephemeroptera	%Plecoptera	%Trichoptera	%Diptera
		1	279	0.75	19	11	50	13	22	15	33
	-	2	1,110	0.77	25	16	80	0	56	24	8.4
		3	1,266	0.63	22	16	87	0	81	6.2	7.6
	RG_GAUT	4	687	1.1	27	19	75	5.2	61	8.7	13
		5	744	1.0	16	13	88	1.2	72	15	2.0
		6	2,025	4.8	21	16	90	0	83	6.5	7.1
Gardine Creek		1	1,467	1.4	23	16	39	0.82	29	8.8	60
	-	2	696	0.88	14	10	34	0	28	6.0	62
	DO 01115	3	711	1.1	17	11	51	0	48	2.5	47
	RG_GANF	4	450	0.27	14	10	48	0	45	2.7	47
	-	5	516	0.39	18	13	59	0	56	3.5	37
	-	6	288	0.22	20	14	30	0	28	2.1	66
		1	4,044	1.6	17	11	13	0	13	0	68
		2	1,197	0.78	19	11	15	0	15	0	79
	<u> </u>	3	306	0.48	15	12	33	0	24	9.8	65
	RG_GHUT	4	552	0.33	16	10	13	0	12	1.1	82
		5	2,424	1.1	19	10	22	0	16	5.4	76
	-	6	7,272	4.2	22	12	20	0	18	2.3	78
		1	5,544	3.4	22	13	38	0	37	0.43	55
	-	2	1,533	1.7	20	14	28	0	20	7.8	62
	DO 011115	3	369	0.49	18	12	46	0	45	0.81	52
	RG_GHNF	4	8,307	3.9	15	8.0	35	0	35	0	65
		5	11,040	2.8	13	9.0	10	0	10	0	88
Upper Greenhills		6	11,628	7.5	15	9.0	31	0	31	0	68
Creek		1	840	0.89	19	12	33	0	26	7.1	64
	=	2	1,215	0.53	16	10	19	0	18	0.99	80
	DO OUDT	3	543	0.9	13	9.0	10	0	9.9	0.55	90
	RG_GHDT	4	321	0.25	22	14	29	0.93	24	3.7	67
	=	5	768	1.5	19	13	29	0	18	11	70
	=	6	363	0.30	19	13	23	0	20	3.3	75
		1	885	0.47	21	14	21	0.68	16	3.7	77
	=	2	876	2.3	20	15	32	2.4	20	8.6	65
	DO OUEE	3	867	0.26	14	11	8.7	0	7.6	1.0	90
	RG_GHFF	4	726	1.8	29	19	23	0.83	17	5.0	73
	=	5	1,494	0.67	21	16	18	1.6	14	2.0	78
		6	5,244	3.0	22	14	11	0	10	0.92	86
		1	2,742	4.6	25	18	50	15	26	9.2	22
		2	2,205	3.5	18	14	32	8.7	12	11	47
Lower Greenhills	DO CUED	3	3,879	6.3	20	15	38	14	11	13	42
Creek	RG_GHBP	4	6,021	8.4	20	16	24	6.0	8.2	9.8	60
		5	1,836	1.8	20	17	34	22	5.2	6.5	41
		6	1,116	0.94	22	19	55	20	5.4	29	30

Notes: No.  $org/m^2$  = number of organisms per square metre;  $g/m^2$  = grams per square metre; LPL = lowest practical level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera.

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon									Den	sity							
Higher Love	l Classification	Family	Lowest Practical						20	119							20	)20	
Higher Leve	Classification	raillily	Level Identification	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3 R	G_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	13	7	0	0	0	0	0	23	27	13	0	0	27	0
Collembola	Collembola	-	Collembola	67	153	60	13	67	117	53	37	57	87	23	63	133	57	40	333
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	13	0	0	0	0	13	0	0	0	3	0	0	27	10	33	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	7	0	0	0	0	0	0	0	0	0	0	13	17	27	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	7	13	0	0	0	0	0	0	0	27	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	7	20	7	0	0	40	3	0	0	0	20	80	7	13	20
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0 27	20	0 13	0	0	3	0	0	0	0	0	3	13 53	3 47	13 147	7
Insecta Insecta	Coleoptera Coleoptera	Elmidae Hydrophilidae	Heterlimnius Hydrophilidae	0	0	0	0	40	0	0	0	0	0	0	0	0	3	27	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	 Diptera	Chironomidae	Brillia	215	28	77	21	96	127	0	0	0	0	0	0	447	135	585	20
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	7
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	7
Insecta	Diptera	Chironomidae	Corynoneura	29	14	14	0	14	3	0	0	0	0	5	0	28	3	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	7	0	0	3	115	31	18	79	25	29	28	3	7	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	14	0	0	0	0	0	0	0	0	21	14	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0	0	7	10	0	0	0	0	0
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	43	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	57	28	139	7	83	21	0	0	0	0	0	0	56	63	178	33
Insecta	Diptera	Chironomidae	Micropsectra Orthogladius complex	57	21	21	14	69	14	0	4	0	0	0	0	126	17	114	0
Insecta	Diptera Diptera	Chironomidae Chironomidae	Orthocladius complex Pagastia	29	21 0	28	0	0	0	317 1,914	39 335	14 55	682	85 174	87 130	0 14	10 3	43 0	13 7
Insecta Insecta	Diptera	Chironomidae	Pagastia Paraphaenocladius	29	7	0	0	14	0	0	0	0	082	0	0	42	28	36	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	230	14	14	29	110	24	0	0	0	4	0	10	0	3	7	13
Insecta	Diptera	Chironomidae	Zalutschia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zavrelimyia	57	21	7	14	0	7	14	4	0	0	5	58	98	94	471	73
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Diptera	Dixidae	Meringodixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	7	7	0	3	53	0	0	0	20	57	0	0	14	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	7	3	0	0	0	0	0
Insecta	Diptera	Empididae	Oreogeton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
		'			1	-		-	_		-			_			-	1	

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

	7	Гахоп									Den	sity							
Higher I ev	el Classification	Family	Lowest Practical						20	019							20	20	
riigilei Levi	er Classification	1 annly	Level Identification	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	14	0	0	0	0	0	40	0	0	0	7	0	13	0	0	7
Insecta	Diptera	Psychodidae	Pericoma	0	0	0	0	0	0	0	3	0	10	0	3	0	0	0	13
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	7	13	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	13	40	0	13	7	173	0	0	7	17	47	120	83	123	40
Insecta	Diptera	Tipulidae	Helius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Insecta	Diptera	Tipulidae	Tipula	0	0	13	0	0	3	0	0	0	0	3	0	93	48	89	7
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Ephemeroptera	Baetidae	Baetis	67	0	13	7	13	0	40	0	0	7	7	0	0	0	7	120
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	7
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	7	0	0	0	0	0	0	0	0	13	20	20	7
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	6,493	1,007	2,273	1,307	3,693	1,150	587	37	50	167	290	517	1,400	357	560	673
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	7	7	0	0	0	0	0	0	0	0	0	0	0	67	7
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	13	0	7	7
Insecta	Plecoptera	Nemouridae	Malenka	13	7	0	0	0	7	13	0	0	7	3	3	35	29	27	17
Insecta	Plecoptera	Nemouridae	Zapada	800	150	283	127	293	167	1,640	107	40	463	223	493	259	58	20	69
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0	27	13	47	7
Insecta	Plecoptera	Perlodidae	Megarcys	27	10	47	13	70	13	37	0	0	3	3	10	0	43	40	20
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	107	13	7	0	0	3	40	7	13	67	17	53	0	0	0	0
Insecta	Trichoptera	Apataniidae	Allomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	40	0	0	0	0	0	27	33	7	20
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Chyranda	0	0	0	0	0	13	0	0	0	0	0	0	107	103	473	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	13	0	0	3	0	3	0	7	0	0
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	0	0	0	0	0	0	0	0	0	0	40	100	160	7
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	27	7	7	3	0	3	27	0	0	3	13	7	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	13	10	0	0	77	17	40	0	3	7	3	3	53	13	33	47
Insecta	Trichoptera	Uenoidae	Neothremma	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

	7								Dei	nsity									
Highen Leve	l Classification	Family	Lowest Practical					2020							20	)21			
nigher Leve	el Classification	Family	Level Identification	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF	-2 RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2 R	G_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	13	67	47	33	27	80	3	0	0	6	12	0	0	6	0
Collembola	Collembola	-	Collembola	53	200	20	60	160	310	53	3	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	7	0	0	0	0	0	3	0	0	12	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	13	0	0	0	0	27	0	36	24	42	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	13	0	0	0	0	0	0	0	0	0	0	0	0	18	0
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	27	20	7	13	13	7	0	3	0	0	18	0	0	6	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	7	0	0	0	0	0	0	0	12	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	27	0	7	0	0	3	40	3	12	84	30	108	12	18	12	9
Insecta	Coleoptera	Hydrophilidae	Hydrophilidae	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	7	3	13	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Chironomidae	Probezzia Brillia	140	90	0	0	0	0	0	3	0	0	0	12	0 12	7	0	7
Insecta	Diptera	Chironomidae	Brundiniella	0	21	7	0	0	0	0	7	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	28	0	7	34	8	0	0	0	0	0	9	0	0	14	0	0
Insecta	Diptera	Chironomidae	Corynoneura	28	7	0	0	0	0	0	0	0	0	0	0	6	0	0	4
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0	0	8	7	55	3	0	0	0	0	0	0	0	7
Insecta	Diptera	Chironomidae	Heleniella	28	14	0	0	16	10	28	0	0	0	0	0	6	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	112	35	13	0	0	0	14	7	0	12	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	560	0	0	14	28	71	344	88	24	0	0	0	0	0	12	18
Insecta	Diptera	Chironomidae	Orthocladius complex	196	0	7	75	79	51	151	14	0	0	0	12	0	7	12	11
Insecta	Diptera	Chironomidae	Pagastia	53	0	360	1,871	873	748	1,362	57	0	0	0	0	0	0	60	90
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	27	0	7	7	7	7	28	10	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	28	21	7	0	0	0	41	3	0	12	0	0	0	7	0	4
Insecta	Diptera	Chironomidae	Zalutschia	0	0	0	0	0	0	0	51	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zavrelimyia	53	104	0	7	55	17	28	0	0	12	9	36	6	14	18	18
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	13	0	13	0	0	0	0	0	12	0	0	0
Insecta	Diptera	Dixidae	Meringodixa	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	20	85	107	70	161	23	0	0	12	12	0	0	30	18
Insecta	Diptera	Empididae	Clinocera	0	0	0	35	7	0	67	10	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Oreogeton	0	0	0	0	0	U	U	0	0	U	U	U	0	U	U	0

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon									Der	nsity							
			Lowest Practical				20	)20							20	)21			
Higher Leve	I Classification	Family	Level Identification	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3 RG	GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	7	50	20	40	3	134	33	0	0	0	0	0	0	51	12
Insecta	Diptera	Psychodidae	Pericoma	0	0	7	27	27	7	67	10	0	0	6	0	0	0	12	3
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	7	13	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	267	48	47	100	53	40	67	27	60	0	36	24	6	0	6	15
Insecta	Diptera	Tipulidae	Helius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	27	0	0	0	0	0	0	3	0	0	6	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	53	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	27	20	0	0	0	0	0	0	12	24	18	12	0	0	24	15
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	7	13	0	0	0	0	3	0	0	0	0	0	0	0	6
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0	0	0	0	0	0	0	0	12	36	0	0	0	12	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	103	25	0	98	50	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	1,707	613	193	200	127	100	147	160	120	461	353	300	148	413	180	72
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	53	0	13	0	7	3	80	20	0	0	12	0	0	0	0	18
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	7	0	0	0	0	0	0	0	0	0	12	18	3
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	240	80	367	300	353	420	317	133	12	24	18	24	42	96	306	162
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	3	0	0	0	0	0	0	0	0	6	3
Insecta	Plecoptera	Perlodidae	Isoperla	0	7	47	100	20	47	133	27	0	24	12	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	107	20	3	0	17	7	77	10	0	6	12	18	12	33	3	12
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	67	73	50	40	13	0	36	0	12	12	0	18	9
Insecta	Trichoptera	Apataniidae	Allomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	96	12	24	96	168	66	12	201
Insecta	Trichoptera	Glossosomatidae	Glossosoma	133	0	67	20	0	0	13	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	3	13	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Insecta	Trichoptera	Limnephilidae	Chyranda	27	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	47	60	20	20	40	10	24	24	0	12	6	0	0	3
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	33	27	7	33	13	47	0	0	6	0	0	0	18	12
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	3
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	187	20	13	20	53	30	60	7	0	12	6	0	6	18	102	60
Insecta	Trichoptera	Uenoidae	Neothremma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

	-	Taxon									Den	sity							
I limban I accel		Familia	Lowest Practical		20	)21							20	)22					
Higher Level	I Classification	Family	Level Identification	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	3 RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	12	0	0	0	0	6	0	0	0	0	0	6	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	30	0	0	12	0	12	0	0	0	0	6	18	6	24	12	0
Collembola	Collembola	-	Collembola	42	24	72	18	0	12	0	0	0	0	0	6	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	6	0	0	18	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	6	0	6	6	6	0	0	0	0	0	6
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	6	0	6	0	6	0	6	6	0	0	0	6	3
Insecta Insecta	Coleoptera Coleoptera	Dytiscidae Elmidae	Dytiscidae Heterlimnius	0	12	0	0	0 42	0 78	6	6 48	0 66	48	6	0	0	0	0	3
Insecta	Coleoptera	Hydrophilidae	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	7	14	0	0	0	0	6	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	6	6	0	0	7	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	34	14	0	32	6	0	0	0	0	0	397	21	7	8	16	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	4
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	6	0	0	0	0	7	0	8	0
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Limnophyes	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0 4
Insecta Insecta	Diptera Diptera	Chironomidae	Macropelopia  Metriocnemus	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	21	0	12	0	0	7	0	6	0	0	27	0	20	0	0	4
Insecta	Diptera	Chironomidae	Orthocladius complex	34	27	0	0	12	0	6	6	0	0	61	72	20	16	16	23
Insecta	Diptera	Chironomidae	Pagastia	254	619	294	123	6	0	0	0	0	0	249	138	89	101	57	45
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	6	7	0	6	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	14	0	0	24	20	0	0	0	6	34	0	7	0	8	0
Insecta	Diptera	Chironomidae	Zalutschia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zavrelimyia	27	69	0	6	0	0	18	12	3	6	7	9	0	8	8	8
Insecta	Diptera	Dixidae	Dixa	0	12	0	0	0	0	0	0	0	12	0	0	0	0	6	0
Insecta	Diptera	Dixidae	Meringodixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	6	72	60	66	0	6	6	6	3	0	48	174	144	36	36	39
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Oreogeton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.3: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon									Dens	sity							
			Lowest Practical		20:	21							20	022					
Higher Leve	el Classification	Family		RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	12	36	18	0	102	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	15	12	0	0	0	0	0	12	3	0	42	6	6	0	24	18
Insecta	Diptera	Psychodidae	Pericoma	18	24	18	18	0	0	0	0	0	0	6	12	30	24	12	39
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	6	24	18	6	0	0	0	0	0	0	0	0	6	12	0	3
Insecta	Diptera	Tipulidae	Helius	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	12	6	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	9	3	6	6	0	0	0	0	0	6	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	36	228	162	72	0	0	0	0	0	0	12	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0	0	0	0	0	0	0	30	9	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	36	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	42	202	0	26	120	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	54	336	42	84	24	372	590	330	385	1,104	0	0	18	12	24	9
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	12	12	0	0	0	0	24	24	6	6	0	12	0	0	18	3
Insecta	Plecoptera	Leuctridae	Leuctridae	6	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	282	1,320	336	390	16	180	174	36	93	324	318	72	180	78	102	48
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	11	84	30	36	12	18	12	18	12	18	84	96	144	84	126	21
Insecta	Plecoptera	Perlodidae	Megarcys	32	0	0	0	0	9	18	9	12	93	6	18	3	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	60	240	108	60	0	0	0	0	0	0	12	0	0	30	18	0
Insecta	Trichoptera	Apataniidae	Allomyia	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	36	24	0	0	6	240	54	24	42	60	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Chyranda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	12	6	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	6	24	0	24	6	0	6	6	3	6	0	0	0	0	0	3
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	48	60	6	6	18	24	6	24	69	51	93	42	18	12	18	3
Insecta	Trichoptera	Uenoidae	Neothremma	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon				Area-ba	sed Kicks					Area-bas	ed Kicks					sed Kicks	
Higher Level	Classification	Family	Lowest Practical				019	1			T	20						020	
		,	Level Identification	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0.429	0.414	0	0	0	0	0	1.39	2.72	0.821	0	0	0.765	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0.792	9.73	1.93	0.828	1.41	6.72	1.02	6.04	22.7	5.17	2.38	3.90	3.86	3.92	1.15	20.5
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0.158	0	0	0	0	0.768	0	0	0	0.199	0	0	0.772	0.691	0.956	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0.423	0	0	0	0	0	0	0	0	0	0	0.386	1.15	0.765	0
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0	0	0.414	0.282	0	0	0	0	0	0	0	0.772	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0 704	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0.423	0.643	0.414	0	0	0.764	0.549	0	0	0	1.23	2.32	0.461	0.382	1.23
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0 430	0	0 0 0 4 7	0 100	0	0	0	0		-	0.386	0.230	0.382	0
Insecta	Coleoptera	Hydrophilidae Staphylinidae	Hydrophilidae	0.317	0	0.429	0	0.847	0.192	0	0	0	0	0	0.205	1.54 0	3.23 0.230	4.21 0.765	0.410
Insecta	Coleoptera		Staphylinidae	0	0	0	0	0.282	0	0	0	0	0	0	0			0.765	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon  Bezzia	0	0	0	0	0.262	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Chironomidae	Probezzia Brillia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	2.56	1.77	2.47	1.33	2.04	7.32	0	0	0	0	0	0	12.9	9.36	16.8	1.23
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0.808	0	0	0.447
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0.000	0.720	0	0.410
Insecta	Diptera	Chironomidae	Diplocladius	0.341	0.884	0.448	0	0.292	0.198	0	0	0	0	0.508	0	0.808	0.240	0	0.410
Insecta	Diptera	Chironomidae	Eukiefferiella	0.041	0	0.440	0	0.232	0.100	0	0	0	0	0.000	0	0.404	0.240	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0.224	0	0	0.198	2.20	5.14	7.30	4.69	2.54	1.78	0.808	0.240	0.204	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0.292	0	0	0	0	0	0	0	0	1.44	0.409	0
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	0	0	0.447	1.02	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0.404	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0.512	0	0	0	0.292	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0.198	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0.682	1.77	4.48	0.444	1.75	1.19	0	0	0	0	0	0	1.62	4.32	5.11	2.05
Insecta	Diptera	Chironomidae	Orthocladius complex	0.682	1.33	0.672	0.887	1.46	0.791	0	0.643	0	0	0	0	3.64	1.20	3.27	0
Insecta	Diptera	Chironomidae	Pagastia	0.341	1.33	0.896	0.887	0.292	0.791	6.05	6.43	5.47	2.46	8.63	5.35	0	0.720	1.23	0.820
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	36.5	55.3	21.9	40.7	17.8	8.02	0.404	0.240	0	0.410
Insecta	Diptera	Chironomidae	Pentaneura	0.341	0.442	0	0	0.292	0	0	0	0	0	0	0	1.21	1.92	1.02	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0	0	0	0	0	0	0	0	1.02	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zalutschia	2.73	0.884	0.448	1.77	2.33	1.38	0	0	0	0.224	0	0.594	0	0.240	0.204	0.820
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0.682	1.33	0.224	0.887	0	0.396	0.275	0.643	0	0	0.508	3.56	2.83	6.48	13.5	4.47
Insecta	Diptera	Dixidae	Meringodixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.410
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0.214	0.414	0	0.195	1.02	0	0	0	2.04	3.49	0	0	0.392	0

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon				Area-bas	sed Kicks					Area-bas	ed Kicks					sed Kicks	
Higher Level	Classification	Family	Lowest Practical				019	T			1	20						)20	1
g		,	Level Identification	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4
Insecta	Diptera	Empididae	Oreogeton	0	0	0	0	0	0	0	0	0	0.398	0.340	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.196	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0	0	0	0	0	0.232	0	0
Insecta	Diptera	Psychodidae	Pericoma	0.164	0	0	0	0	0	0.764	0	0	0	0.680	0	0.386	0	0	0.410
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0.549	0	0.596	0	0.205	0	0	0	0.820
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	0	0	0	0	0	0	0	0	0	0.680	0.821	0	0	0	0
Insecta	Diptera	Tipulidae	Helius	0	0.846	1.29	0	0.282	0.390	3.31	0	0	0.398	1.70	2.87	3.47	5.71	3.52	2.46
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.196	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0.429	0	0	0.195	0	0	0	0	0.340	0	2.70	3.33	2.55	0.410
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0.414	0	0	0	0	0	0	0	0	0	0	0	0.410
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0.792	0	0.429	0.414	0.282	0	0.764	0	0	0.398	0.680	0	0	0	0.191	7.38
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0	0	0	0	0	0	0.255	0	0	0	0	0	0	0	0	0.410
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0.414	0	0	0	0	0	0	0	0	0.386	1.38	0.574	0.410
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	77.2	63.9	73.1	81.2	78.2	66.2	11.2	6.04	20.0	9.94	29.6	31.8	40.5	24.6	16.1	41.4
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0.423	0.214	0	0	0	0	0	0	0	0	0	0	0	1.91	0.410
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	0.386	0	0.191	0.410
Insecta	Plecoptera	Nemouridae	Zapada	0.158	0.423	0	0	0	0.384	0.255	0	0	0.398	0.340	0.205	0.999	2.00	0.765	1.07
Insecta	Plecoptera	Peltoperlidae	Yoraperla	9.51	9.51	9.11	7.87	6.21	9.60	31.3	17.6	16.0	27.6	22.8	30.4	7.49	3.99	0.574	4.26
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0.509	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0	0	0	0	0	0.772	0.922	1.34	0.410
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0.317	0.634	1.50	0.828	1.48	0.768	0.700	0	0	0.199	0.340	0.616	0	3.00	1.15	1.23
Insecta	Trichoptera	Apataniidae	Allomyia	1.27	0.846	0.214	0	0	0.192	0.764	1.10	5.33	3.98	1.70	3.29	0	0	0	0
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.410
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0.764	0	0	0	0	0	0.772	2.30	0.191	1.23
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Chyranda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0.768	0	0	0	0	0	0	3.09	7.14	13.6	0
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	0	0	0	0	0.255	0	0	0.199	0	0.205	0	0.461	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	1.16	6.91	4.59	0.410
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0.386	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0.317	0.423	0.214	0.207	0	0.192	0.509	0	0	0.199	1.36	0.411	0	0	0	0
Insecta	Trichoptera	Uenoidae	Neothremma	0.158	0.634	0	0	1.62	0.960	0.764	0	1.33	0.398	0.340	0.205	1.54	0.922	0.956	2.87

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon		Area-ba	sed Kicks			Area-bas	sed Kicks					Area-base	d Kicks			Area-ba	sed Kicks
Higher Lovel	Classification	Family	Lowest Practical	2	2020			20	)20					202	:1			2	021
Higher Level	Classification	raillily	Level Identification	RG_GAUT-	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.645	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0.930	4.65	1.46	1.50	1.26	2.13	0.408	0	0	0.885	1.71	0	0	0.645	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	1.27	13.9	1.40	1.88	7.20	14.7	1.42	0.408	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0.465	0	0	0	0	0	0.408	0	0	1.77	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0.930	0	0	0	0	0.709	0	8.57	2.61	6.19	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0.930	0	0	0	0	0	0	0	0	0	0	0	0	1.94	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0.408	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0.633	1.40	0.465	0.418	0.600	0.315	0	0.408	0	0	2.65	0	0	0.778	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0.465	0	0	0	0	0	0	0	1.31	0	0	0	0	0	0
Insecta	Coleoptera	Hydrophilidae	Hydrophilidae	0.633	0	0.465	0	0	0.158	1.06	0.408	2.86	9.15	4.42	15.4	2.15	2.33	1.29	1.12
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0.600	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon	0	0	0	0	0.300	0.158	0.354	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0	0	0.408	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0.474	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	3.32	6.31	0	0	0	0	0	0.414	0	0	0	1.71	2.15	0.889	0	0.899
Insecta	Diptera	Chironomidae	Chaetocladius	0	1.46	0.465	0	0	0	0	0.827	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.663	0	0.465	1.07	0.356	0	0	0	0	0	1.33	0	0	1.78	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0.663	0.485	0	0	0	0	0	0	0	0	0	0	1.08	0	0	0.449
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0.356	0.319	1.46	0.414	0	0	0	0	0	0	0	0.899
Insecta	Diptera	Chironomidae	Hydrobaenus	0.663	0.970	0	0	0.712	0.478	0.731	0	0	0	0	0	1.08	0	0	0
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	1.24	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	·	0	0	0	0.414	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Macropelopia	0.663	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera		Metriocnemus	2.65	2.43	0.930	0	0	0	0.366	0.827	0	1.31	0	0	0	0	0	0
Insecta Insecta	Diptera	Chironomidae Chironomidae	Micropsectra Orthocladius complex	13.3	0	0.930	0.426	1.25	3.35	9.14	10.8	5.71	0	0	0	0	0	1.29	2.25
Insecta	Diptera	Chironomidae	Pagastia	4.64	0	0.465	2.34	3.56	2.39	4.02	1.65	0	0	0	1.71	0	0.889	1.29	1.35
Insecta	Diptera	Chironomidae	Paraphaenocladius	1.27	0	25.1	58.6	39.2	35.4	36.2	7.03	0	0	0	0	0	0.869	6.45	11.2
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0.366	0	0	0	0	0	0	0	0.43	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0.300	0	2.86	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0.633	0	0.465	0.213	0.311	0.319	0.731	1.24	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zalutschia	0.663	1.46	0.465	0.213	0.511	0.519	1.10	0.414	0	1.31	0	0	0	0.889	0	0.449
Insecta	Diptera	Chironomidae	Zavrelimyia	0.003	0	0.403	0	0	0	0	6.20	0	0	0	0	0	0.009	0	0.449
Insecta	Diptera	Dixidae	Dixa	1.27	7.28	0	0.213	2.49	0.797	0.731	0.20	0	1.31	1.33	5.13	1.08	1.78	1.94	2.25
Insecta	Diptera	Dixidae	Meringodixa	0	0	0	0.213	0.600	0.797	0.751	0	0	0	0	0	2.15	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	0	0.000	0	0.330	0	0	0	0	0	1.08	0	0	0
	•			0	0	1.40	2.65	4.80	3.29	4.27	2.86	0	0	1.77	1.71	0	0	3.23	2.24
Insecta	Diptera	Empididae	Clinocera	U	U	1.40	∠.05	4.80	3.29	4.21	∠.४७	U	U	1.//	1.71	U	U	3.23	2.24

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon		Area-ba	sed Kicks			Area-bas	ed Kicks					Area-ba	sed Kicks			Area-ba	ased Kicks
			Lowest Practical	2	020			20	20					20	021			2	2021
Higher Level	Classification	Family	Level Identification	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	1 RG_GANF-2
Insecta	Diptera	Empididae	Oreogeton	0	0	0	1.11	0.300	0.494	1.78	1.22	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0	0	0.885	0	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	0	0.474	3.49	0.626	1.80	0.158	3.56	4.08	0	0	0	0	0	0	5.48	1.49
Insecta	Diptera	Psychodidae	Psychoda	0	0	0.465	0.835	1.20	0.315	1.78	1.22	0	0	0.885	0	0	0	1.29	0.373
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0.356	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	0	0	0	0	0.315	0.356	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Helius	6.33	3.32	3.26	3.13	2.40	1.89	1.78	3.27	14.3	0	5.31	3.42	1.08	0	0.645	1.87
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	0.633	0	0	0	0	0	0	0.408	0	0	0.885	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	1.71	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	1.27	0.474	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0.633	1.40	0	0	0	0	0	0	2.86	2.61	2.65	1.71	0	0	2.58	1.87
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0	0.465	0.930	0	0	0	0	0.408	0	0	0	0	0	0	0	0.746
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	2.86	3.92	0	0	0	1.56	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.373
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	11.2	3.64	0	17.6	6.42	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	40.5	42.8	13.5	6.26	5.70	4.73	3.90	19.6	28.6	50.3	52.1	42.7	26.4	53.5	19.4	8.96
Insecta	Plecoptera	Leuctridae	Leuctridae	1.27	0	0.930	0	0.300	0.158	2.13	2.45	0	0	1.77	0	0	0	0	2.24
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0.209	0	0	0	0	0	0	0	0	0	1.56	1.94	0.373
Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0	0	0	0.443	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Yoraperla	5.70	5.58	25.6	9.39	15.9	19.9	8.41	16.3	2.86	2.61	2.65	3.42	7.53	12.4	32.9	20.1
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0.158	0	0	0	0	0	0	0	0	0.645	0.373
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.465	3.26	3.13	0.900	2.21	3.54	3.27	0	2.61	1.77	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	2.53	1.40	0.233	0	0.750	0.315	2.04	1.22	0	0.654	1.77	2.56	2.15	4.28	0.323	1.49
Insecta	Trichoptera	Apataniidae	Allomyia	0	0	0	2.09	3.30	2.37	1.06	1.63	0	3.92	0	1.71	2.15	0	1.94	1.12
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	22.9	1.31	3.54	13.7	30.1	8.56	1.29	25.0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	3.16	0	4.65	0.626	0	0	0.354	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0.158	0.354	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Chyranda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.746
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0.633	2.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	3.26	1.88	0.900	0.946	1.06	1.22	5.71	2.61	0	1.71	1.08	0	0	0.373
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	2.33	0.835	0.300	1.58	0.354	5.71	0	0	0.885	0	0	0	1.94	1.49
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0.465	0	0	0	0	0	0	0	0	0	0	0	0	0.373
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Uenoidae	Neothremma	4.43	1.40	0.930	0.626	2.40	1.42	1.59	0.816	0	1.31	0.885	0	1.08	2.33	11.0	7.46

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon			Area-base	ed Kicks				Area-ba	sed Kicks					Area-ba	sed Kicks		
Higher Level	Classification	Family	Lowest Practical		202	21				20	)22					2	022		
riigher Level	Olassification	1 anniy	Level Identification	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	1.08	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0.366	0	0	0	0	0.474	0	0	0	0	0	0.844	0	0	0
Collembola	Collembola	-	Collembola	2.75	0	0	1.25	0	1.08	0	0	0	0	0.409	2.59	0.844	5.33	2.33	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	3.86	0.733	6.19	1.88	0	1.08	0	0	0	0	0	0.862	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	2.15	0	0	2.62	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	Limnesia	0	0	0	0	0	0.541	0	0.873	0.806	0.296	0	0	0	0	0	2.08
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0.625	0	0.541	0	0.873	0	0.296	0.409	0	0	0	1.16	1.04
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0.474	0.873	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Hydrophilidae	Hydrophilidae	0	0.366	0	0	15.1	7.03	4.74	6.99	8.87	2.37	0.409	0	0	0	0	1.04
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Atrichopogon	0	0	0	0	0	0	0	0	0	0.296	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0	0	0	0	0	0.409	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0.948	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	1.08	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0	0	0.593	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0.631	0.420	0	0	0	0	0.474	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0.474	0.873	0	0	0.458	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Heleniella	3.16	0.420	0	3.38	2.15	0	0	0	0	0	27.0	2.95	0.959	1.73	3.16	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0.873	0.806	0	0	0	0	0	0	1.31
Insecta	Diptera	Chironomidae	Krenosmittia	0	0	0	0	0	0	0	0.873	0	0	0	0	0.959	0	1.58	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	•	0	0 000	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Macropelopia	0	0	0	0	0 6.45	0.608	0	0	0	0.296	0	0	0	0	0	0 1.31
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0.45		0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera	Chironomidae	Micropsectra Orthocladius complex	1.89	0	1.05	0	0	0.608	0	0.873	0	0	1.83	0	2.88	0	0	1.31
Insecta	Diptera	Chironomidae	Pagastia	3.16	0.839	0	0	4.30	0.000	0.474	0.873	0	0	4.13	10.3	2.88	3.45	3.16	7.88
Insecta	Diptera	Chironomidae	Paraphaenocladius	23.4	18.9	25.2	12.8	2.15	0	0.474	0.673	0	0	17.0	19.9	12.5	22.4	11.1	15.8
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	2.15	0.608	0	0.873	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0.000	0	0.073	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Zalutschia	0	0.420	0	0	8.60	1.82	0	0	0	0.296	2.29	0	0.959	0	1.58	0
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0.420	0	0	0.00	0	0	0	0	0.290	0	0	0.959	0	0	0
	Diptera	Dixidae	Dixa	2.52	2.10	0	0.675	0	0	1.42	1.75	0.403	0.296	0.458	1.33	0	1.73	1.58	2.63
Insecta	· · · · · · · · · · · · · · · · · · ·	Dixidae	Meringodixa	0	0.366	0	0.675	0		0	0	0.403	0.296	0.458	0	0	0	1.16	0
Insecta	Diptera				+				0	-					-				
Insecta	Diptera	Empididae	Clinagera	0	0	0	0	0	0 544	0 474	0 0 0 0 7 2	0 403	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0.551	2.20	5.15	6.88	0	0.541	0.474	0.873	0.403	0	3.27	25.0	20.2	8.00	6.98	13.5

Table G.4: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on the Lowest Practical Level of Taxonomy, 2019 to 2022

		Taxon			Area-base	ed Kicks				Area-ba	sed Kicks					Area-ba	sed Kicks		
Higher Level	Classification	Family	Lowest Practical		202	21				20	022					20	022		
Tilglier Level	Classification	1 anniy	Level Identification	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Insecta	Diptera	Empididae	Oreogeton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	1.08	2.84	2.62	0	5.04	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	1.38	0.366	0	0	0	0	0	1.75	0.403	0	2.86	0.862	0.844	0	4.65	6.25
Insecta	Diptera	Psychodidae	Psychoda	1.65	0.733	1.55	1.88	0	0	0	0	0	0	0.409	1.72	4.22	5.33	2.33	13.5
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Helius	0.551	0.733	1.55	0.625	0	0	0	0	0	0	0	0	0.844	2.67	0	1.04
Insecta	Diptera	Tipulidae	Limnophila	0	0	0.515	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pseudolimnophila	0	0	0	0	4.30	0.541	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0.551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.04
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	3.23	0.270	0.474	0.873	0	0	0	0	0	1.33	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0.873	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	3.31	6.96	13.9	7.50	0	0	0	0	0	0	0.818	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygma	0.551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	4.37	1.21	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	12.9	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	3.83	15.9	0	3.45	5.93	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	4.96	10.3	3.61	8.75	8.60	33.5	46.6	48.0	51.8	54.5	0	0	2.53	2.67	4.65	3.12
Insecta	Plecoptera	Leuctridae	Leuctridae	1.10	0.366	0	0	0	0	1.90	3.49	0.806	0.296	0	1.72	0	0	3.49	1.04
Insecta	Plecoptera	Nemouridae	Malenka	0.551	0	0	0	0	0	0	0	0	0.889	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0	2.87	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Yoraperla	25.9	40.3	28.9	40.6	5.73	16.2	13.7	5.24	12.5	16.0	21.7	10.3	25.3	17.3	19.8	16.7
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0.409	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0.964	2.56	2.58	3.75	4.30	1.62	0.948	2.62	1.61	0.889	5.73	13.8	20.2	18.7	24.4	7.29
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	2.89	0	0	0	0	0.811	1.42	1.31	1.61	4.59	0.409	2.59	0.422	0	0	0
Insecta	Trichoptera	Apataniidae	Allomyia	5.51	7.33	9.28	6.25	0	0	0	0	0	0	0.818	0	0	6.67	3.49	0
Insecta	Trichoptera	Apataniidae	Apatania	0	0	0	0	0	0	0.474	0.873	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	2.04	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	3.31	0.733	0	0	2.15	21.6	4.27	3.49	5.65	2.96	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0.409	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Chyranda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Hesperophylax	0	0	0	0	4.30	0.541	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0.551	0.733	0	2.50	2.15	0	0.474	0.873	0.403	0.296	0	0	0	0	0	1.04
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	0	0	0	0.741	0	0	0	0	0	0
Insecta	Trichoptera	Uenoidae	Neothremma	4.41	1.83	0.515	0.625	6.45	2.16	0.474	3.49	9.27	2.52	6.34	6.03	2.53	2.67	3.49	1.04

Table G.5: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Der	nsity					
Higher Level	Classification	Family						20	)19					
Higher Level	Ciassification	railily	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	13	7	0	0	0	0	0	23	27	13
Euchelicerata	Trombidiformes	Hydryphantidae	13	0	0	0	0	13	0	0	0	3	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	7	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	7	13	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	7	20	7	0	0	40	3	0	0	0	20
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	27	20	13	0	40	3	0	0	0	0	0	3
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	13	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	746	153	307	100	427	216	2,360	413	87	813	313	313
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0	0	7	7	0	3	53	0	0	7	23	57
Insecta	Diptera	Pelecorhynchidae	14	0	0	0	0	0	40	0	0	0	7	0
Insecta	Diptera	Psychodidae	0	0	0	0	0	0	0	3	0	10	0	3
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	7	13
Insecta	Diptera	Tipulidae	0	13	53	0	13	10	173	0	0	7	20	47
Insecta	Ephemeroptera	Ameletidae	0	0	0	7	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	67	0	13	7	13	0	40	0	0	7	7	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	13	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	7	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	6,493	1,007	2,273	1,307	3,693	1,150	587	37	50	167	290	517
Insecta	Plecoptera	Chloroperlidae	0	7	7	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	813	157	283	127	293	173	1,653	107	40	470	227	497
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	27	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	27	10	47	13	70	13	37	0	0	3	3	10
Insecta	Plecoptera	Taeniopterygidae	107	13	7	0	0	3	40	7	13	67	17	53
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	40	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	27	7	7	3	0	17	40	0	0	7	13	10
Insecta	Trichoptera	Rhyacophilidae	13	10	0	0	77	17	40	0	3	7	3	3
Insecta	Trichoptera	Uenoidae	0	13	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	67	153	60	13	67	117	53	37	57	87	23	63

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.5: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Der	nsity					
I limbood on the	01	F						20	)20					
Higher Level	Classification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	27	0	0	13	67	47	33	27	80	3
Euchelicerata	Trombidiformes	Hydryphantidae	27	10	33	0	0	7	0	0	0	0	0	3
Euchelicerata	Trombidiformes	Hygrobatidae	13	17	27	0	0	13	0	0	0	0	27	0
Euchelicerata	Trombidiformes	Lebertiidae	27	0	0	0	0	13	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	3
Euchelicerata	Trombidiformes	Sperchontidae	80	7	13	20	27	20	7	13	13	7	0	3
Insecta	Coleoptera	Dytiscidae	13	3	13	0	0	7	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	53	47	147	7	27	0	7	0	0	3	40	3
Insecta	Coleoptera	Hydrophilidae	0	3	27	0	0	0	0	0	13	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	7	3	13	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	7	0	0	0	0	0	3
Insecta	Diptera	Chironomidae	893	392	1,454	173	1,280	292	407	2,007	1,073	910	2,064	257
Insecta	Diptera	Dixidae	0	0	0	7	0	0	0	0	13	0	13	0
Insecta	Diptera	Empididae	0	3	20	0	0	0	20	120	113	80	228	33
Insecta	Diptera	Pelecorhynchidae	13	0	0	7	0	7	50	20	40	3	134	33
Insecta	Diptera	Psychodidae	0	0	0	13	0	0	7	27	27	7	80	10
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	7	13	0
Insecta	Diptera	Tipulidae	213	131	218	47	347	54	47	100	53	40	67	30
Insecta	Ephemeroptera	Ameletidae	0	0	0	7	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	7	120	27	20	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	7	0	7	13	0	0	0	0	3
Insecta	Ephemeroptera	Heptageniidae	13	20	20	7	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	1,400	357	560	673	1,707	613	193	200	127	100	147	160
Insecta	Plecoptera	Chloroperlidae	0	0	67	7	53	0	13	0	7	3	80	20
Insecta	Plecoptera	Leuctridae	13	0	7	7	0	0	0	7	0	0	0	0
Insecta	Plecoptera	Nemouridae	293	87	47	87	240	80	367	300	353	420	333	133
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	3	0	0
Insecta	Plecoptera	Perlodidae	27	57	87	27	107	27	50	100	37	53	210	37
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0	67	73	50	40	13
Insecta	Trichoptera	Apataniidae	0	0	0	7	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	27	33	7	20	133	0	67	20	0	0	13	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	3	13	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	160	210	633	7	27	33	87	87	27	53	53	57
Insecta	Trichoptera	Rhyacophilidae	53	13	33	47	187	20	13	20	53	30	60	7
Insecta	Trichoptera	Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	133	57	40	333	53	200	20	60	160	310	53	3

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.5: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Der	nsity					
								20	)21					
Higher Level	Classification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	6	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	12	0	0
Clitellata	-	Enchytraeidae	0	0	6	12	0	0	6	0	30	0	0	12
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	12	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	36	24	42	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	18	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	18	0	0	6	0	0	0	0	0	6
Insecta	Coleoptera	Dytiscidae	0	12	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	12	84	30	108	12	18	12	9	0	12	0	0
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	36	36	18	60	30	48	102	159	378	756	306	162
Insecta	Diptera	Dixidae	0	0	0	0	18	0	0	0	0	12	0	0
Insecta	Diptera	Empididae	0	0	18	12	0	0	30	18	6	72	60	66
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	0	0	51	12	15	12	0	0
Insecta	Diptera	Psychodidae	0	0	6	0	0	0	12	3	18	24	18	18
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	60	0	42	36	6	0	6	15	12	24	24	6
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	12	24	18	12	0	0	24	15	36	228	162	72
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	6	6	0	0	0
Insecta	Ephemeroptera	Heptageniidae	12	36	0	0	0	12	0	3	0	0	0	0
Insecta	Plecoptera	Capniidae	120	564	378	300	246	462	180	72	54	336	42	84
Insecta	Plecoptera	Chloroperlidae	0	0	12	0	0	0	0	18	12	12	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	12	18	3	6	0	0	0
Insecta	Plecoptera	Nemouridae	12	24	18	24	42	96	306	162	282	1,320	336	390
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	6	3	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	30	24	18	12	33	3	12	42	84	30	36
Insecta	Plecoptera	Taeniopterygidae	0	36	0	12	12	0	18	9	60	240	108	60
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	96	12	24	96	168	66	12	201	36	24	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	6	0	0	0	0
Insecta	Trichoptera	Limnephilidae	24	24	6	12	6	0	18	18	6	24	0	24
Insecta	Trichoptera	Rhyacophilidae	0	12	6	0	6	18	102	60	48	60	6	6
Insecta	Trichoptera	Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	42	24	72	18

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.5: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Der	nsity					
								20	)22					
Higher Level	Classification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	12	6	0	0	0	0	0	6	0	0	0
Clitellata	-	Enchytraeidae	0	12	0	0	0	0	6	18	6	24	12	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	6	0	0	18	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	6	0	6	6	6	0	0	0	0	0	6
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	6	0	6	0	6	6	0	0	0	6	3
Insecta	Coleoptera	Dytiscidae	0	0	6	6	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	42	78	60	48	66	48	6	0	0	0	0	3
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	6	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	12	12	0	0	12	6	0	0	0	0	0
Insecta	Diptera	Chironomidae	72	54	36	48	9	18	780	240	150	132	114	87
Insecta	Diptera	Dixidae	0	0	0	0	0	12	0	0	0	0	6	0
Insecta	Diptera	Empididae	0	18	42	24	3	102	48	174	144	36	36	39
Insecta	Diptera	Pelecorhynchidae	0	0	0	12	3	0	42	6	6	0	24	18
Insecta	Diptera	Psychodidae	0	0	0	0	0	0	6	12	30	24	12	39
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	21	9	6	6	0	0	0	0	6	18	0	6
Insecta	Ephemeroptera	Ameletidae	0	0	0	6	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	12	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	36	0	0	30	9	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	24	414	792	330	411	1,224	0	0	18	12	24	9
Insecta	Plecoptera	Chloroperlidae	0	0	24	24	6	6	0	12	0	0	18	3
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	18	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	24	180	174	36	93	324	318	72	180	78	102	48
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	12	27	30	27	24	111	90	114	147	84	126	21
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	12	0	0	30	18	0
Insecta	Trichoptera	Apataniidae	0	0	6	6	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	30	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	6	240	54	24	42	60	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	6	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	18	6	6	6	3	21	0	0	0	0	0	3
Insecta	Trichoptera	Rhyacophilidae	18	24	6	24	69	51	93	42	18	12	18	3
Insecta	Trichoptera	Uenoidae	0	0	6	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	12	0	0	0	0	0	6	0	0	0	0

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.6: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Area-based h	Kick Samples					
								20	19					
Higher Level	Classification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0.429	0.414	0	0	0	0	0	1.39	2.72	0.821
Euchelicerata	Trombidiformes	Hydryphantidae	0.158	0	0	0	0	0.768	0	0	0	0.199	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0.423	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0.414	0.282	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0.423	0.643	0.414	0	0	0.764	0.549	0	0	0	1.23
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0.317	1.27	0.429	0	0.847	0.192	0	0	0	0	0	0.205
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0.282	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	8.87	9.73	9.86	6.21	9.04	12.5	45.1	68.1	34.7	48.5	32.0	19.3
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0	0	0.214	0.414	0	0.195	1.02	0	0	0.398	2.38	3.49
Insecta	Diptera	Pelecorhynchidae	0.164	0	0	0	0	0	0.764	0	0	0	0.680	0
Insecta	Diptera	Psychodidae	0	0	0	0	0	0	0	0.549	0	0.596	0	0.205
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0.680	0.821
Insecta	Diptera	Tipulidae	0	0.846	1.71	0	0.282	0.584	3.31	0	0	0.398	2.04	2.87
Insecta	Ephemeroptera	Ameletidae	0	0	0	0.414	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0.792	0	0.429	0.414	0.282	0	0.764	0	0	0.398	0.680	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0.255	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0.414	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	77.2	63.9	73.1	81.2	78.2	66.2	11.2	6.04	20.0	9.94	29.6	31.8
Insecta	Plecoptera	Chloroperlidae	0	0.423	0.214	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	9.67	9.94	9.11	7.87	6.21	9.98	31.6	17.6	16.0	28.0	23.1	30.6
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0.509	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0.317	0.634	1.50	0.828	1.48	0.768	0.700	0	0	0.199	0.340	0.616
Insecta	Plecoptera	Taeniopterygidae	1.27	0.846	0.214	0	0	0.192	0.764	1.10	5.33	3.98	1.70	3.29
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0.764	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.317	0.423	0.214	0.207	0	0.960	0.764	0	0	0.398	1.36	0.616
Insecta	Trichoptera	Rhyacophilidae	0.158	0.634	0	0	1.62	0.960	0.764	0	1.33	0.398	0.340	0.205
Insecta	Trichoptera	Uenoidae	0	0.846	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0.792	9.73	1.93	0.828	1.41	6.72	1.02	6.04	22.7	5.17	2.38	3.90

Table G.6: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Area-based l	Kick Samples					
	<b>.</b>							20	20					
Higher Level	Classification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0.765	0	0	0.930	4.65	1.46	1.50	1.26	2.13	0.408
Euchelicerata	Trombidiformes	Hydryphantidae	0.772	0.691	0.956	0	0	0.465	0	0	0	0	0	0.408
Euchelicerata	Trombidiformes	Hygrobatidae	0.386	1.15	0.765	0	0	0.930	0	0	0	0	0.709	0
Euchelicerata	Trombidiformes	Lebertiidae	0.772	0	0	0	0	0.930	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0.408
Euchelicerata	Trombidiformes	Sperchontidae	2.32	0.461	0.382	1.23	0.633	1.40	0.465	0.418	0.600	0.315	0	0.408
Insecta	Coleoptera	Dytiscidae	0.386	0.230	0.382	0	0	0.465	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	1.54	3.23	4.21	0.410	0.633	0	0.465	0	0	0.158	1.06	0.408
Insecta	Coleoptera	Hydrophilidae	0	0.230	0.765	0	0	0	0	0	0.600	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0.300	0.158	0.354	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0.474	0	0	0	0	0	0.408
Insecta	Diptera	Chironomidae	25.9	27.1	41.7	10.7	30.4	20.4	28.4	62.8	48.3	43.1	54.8	31.4
Insecta	Diptera	Dixidae	0	0	0	0.410	0	0	0	0	0.600	0	0.356	0
Insecta	Diptera	Empididae	0	0.232	0.587	0	0	0	1.40	3.76	5.10	3.79	6.05	4.08
Insecta	Diptera	Pelecorhynchidae	0.386	0	0	0.410	0	0.474	3.49	0.626	1.80	0.158	3.56	4.08
Insecta	Diptera	Psychodidae	0	0	0	0.820	0	0	0.465	0.835	1.20	0.315	2.14	1.22
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0.315	0.356	0
Insecta	Diptera	Tipulidae	6.18	9.04	6.27	2.87	8.23	3.79	3.26	3.13	2.40	1.89	1.78	3.67
Insecta	Ephemeroptera	Ameletidae	0	0	0	0.410	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0.191	7.38	0.633	1.40	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0.410	0	0.465	0.930	0	0	0	0	0.408
Insecta	Ephemeroptera	Heptageniidae	0.386	1.38	0.574	0.410	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	40.5	24.6	16.1	41.4	40.5	42.8	13.5	6.26	5.70	4.73	3.90	19.6
Insecta	Plecoptera	Chloroperlidae	0	0	1.91	0.410	1.27	0	0.930	0	0.300	0.158	2.13	2.45
Insecta	Plecoptera	Leuctridae	0.386	0	0.191	0.410	0	0	0	0.209	0	0	0	0
Insecta	Plecoptera	Nemouridae	8.49	5.99	1.34	5.33	5.70	5.58	25.6	9.39	15.9	19.9	8.86	16.3
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0.158	0	0
Insecta	Plecoptera	Perlodidae	0.772	3.92	2.49	1.64	2.53	1.86	3.49	3.13	1.65	2.52	5.58	4.49
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0	2.09	3.30	2.37	1.06	1.63
Insecta	Trichoptera	Apataniidae	0	0	0	0.410	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0.772	2.30	0.191	1.23	3.16	0	4.65	0.626	0	0	0.354	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0.158	0.354	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	4.63	14.5	18.2	0.410	0.633	2.33	6.05	2.71	1.20	2.52	1.42	6.94
Insecta	Trichoptera	Rhyacophilidae	1.54	0.922	0.956	2.87	4.43	1.40	0.930	0.626	2.40	1.42	1.59	0.816
Insecta	Trichoptera	Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	3.86	3.92	1.15	20.5	1.27	13.9	1.40	1.88	7.20	14.7	1.42	0.408

Table G.6: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Area-based	Kick Samples					
								20	)21					
Higher Level C	lassification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0.645	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0.366	0	0
Clitellata	-	Enchytraeidae	0	0	0.885	1.71	0	0	0.645	0	2.75	0	0	1.25
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	1.77	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	8.57	2.61	6.19	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	1.94	0	0	0	0	0
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	2.65	0	0	0.778	0	0	0	0	0	0.625
Insecta	Coleoptera	Dytiscidae	0	1.31	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	2.86	9.15	4.42	15.4	2.15	2.33	1.29	1.12	0	0.366	0	0
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	8.57	3.92	2.65	8.55	5.38	6.23	11.0	19.8	34.7	23.1	26.3	16.9
Insecta	Diptera	Dixidae	0	0	0	0	3.23	0	0	0	0	0.366	0	0
Insecta	Diptera	Empididae	0	0	2.65	1.71	0	0	3.23	2.24	0.551	2.20	5.15	6.88
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	0	0	5.48	1.49	1.38	0.366	0	0
Insecta	Diptera	Psychodidae	0	0	0.885	0	0	0	1.29	0.373	1.65	0.733	1.55	1.88
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	14.3	0	6.19	5.13	1.08	0	0.645	1.87	1.10	0.733	2.06	0.625
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	2.86	2.61	2.65	1.71	0	0	2.58	1.87	3.31	6.96	13.9	7.50
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0.746	0.551	0	0	0
Insecta	Ephemeroptera	Heptageniidae	2.86	3.92	0	0	0	1.56	0	0.373	0	0	0	0
Insecta	Plecoptera	Capniidae	28.6	61.4	55.8	42.7	44.1	59.9	19.4	8.96	4.96	10.3	3.61	8.75
Insecta	Plecoptera	Chloroperlidae	0	0	1.77	0	0	0	0	2.24	1.10	0.366	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	1.56	1.94	0.373	0.551	0	0	0
Insecta	Plecoptera	Nemouridae	2.86	2.61	2.65	3.42	7.53	12.4	32.9	20.1	25.9	40.3	28.9	40.6
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0.645	0.373	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	3.27	3.54	2.56	2.15	4.28	0.323	1.49	3.86	2.56	2.58	3.75
Insecta	Plecoptera	Taeniopterygidae	0	3.92	0	1.71	2.15	0	1.94	1.12	5.51	7.33	9.28	6.25
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	22.9	1.31	3.54	13.7	30.1	8.56	1.29	25.0	3.31	0.733	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0.746	0	0	0	0
Insecta	Trichoptera	Limnephilidae	5.71	2.61	0.885	1.71	1.08	0	1.94	2.24	0.551	0.733	0	2.50
Insecta	Trichoptera	Rhyacophilidae	0	1.31	0.885	0	1.08	2.33	11.0	7.46	4.41	1.83	0.515	0.625
Insecta	Trichoptera	Uenoidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	3.86	0.733	6.19	1.88

Table G.6: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Gardine Creek Based on Family Level of Taxonomy, 2019 to 2022

	Taxon							Area-based	Kick Samples					
								20	)22					
Higher Level C	lassification	Family	RG_GAUT-1	RG_GAUT-2	RG_GAUT-3	RG_GAUT-4	RG_GAUT-5	RG_GAUT-6	RG_GANF-1	RG_GANF-2	RG_GANF-3	RG_GANF-4	RG_GANF-5	RG_GANF-6
Bivalvia	Veneroida	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	1.08	0.474	0	0	0	0	0	0.844	0	0	0
Clitellata	_	Enchytraeidae	0	1.08	0	0	0	0	0.409	2.59	0.844	5.33	2.33	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	2.15	0	0	2.62	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0.541	0	0.873	0.806	0.296	0	0	0	0	0	2.08
Euchelicerata	Trombidiformes	Limnesiidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0.541	0	0.873	0	0.296	0.409	0	0	0	1.16	1.04
Insecta	Coleoptera	Dytiscidae	0	0	0.474	0.873	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	15.1	7.03	4.74	6.99	8.87	2.37	0.409	0	0	0	0	1.04
Insecta	Coleoptera	Hydrophilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0.296	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	1.08	0.948	0	0	0.593	0.409	0	0	0	0	0
Insecta	Diptera	Chironomidae	25.8	4.86	2.84	6.99	1.21	0.889	53.2	34.5	21.1	29.3	22.1	30.2
Insecta	Diptera	Dixidae	0	0	0	0	0	0.593	0	0	0	0	1.16	0
Insecta	Diptera	Empididae	0	1.62	3.32	3.49	0.403	5.04	3.27	25.0	20.2	8.00	6.98	13.5
Insecta	Diptera	Pelecorhynchidae	0	0	0	1.75	0.403	0	2.86	0.862	0.844	0	4.65	6.25
Insecta	Diptera	Psychodidae	0	0	0	0	0	0	0.409	1.72	4.22	5.33	2.33	13.5
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	7.53	0.811	0.474	0.873	0	0	0	0	0.844	4.00	0	2.08
Insecta	Ephemeroptera	Ameletidae	0	0	0	0.873	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0.818	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	12.9	0	0	4.37	1.21	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	8.60	37.3	62.6	48.0	55.2	60.4	0	0	2.53	2.67	4.65	3.12
Insecta	Plecoptera	Chloroperlidae	0	0	1.90	3.49	0.806	0.296	0	1.72	0	0	3.49	1.04
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0.889	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	8.60	16.2	13.7	5.24	12.5	16.0	21.7	10.3	25.3	17.3	19.8	16.7
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0.409	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	4.30	2.43	2.37	3.93	3.23	5.48	6.13	16.4	20.7	18.7	24.4	7.29
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0.818	0	0	6.67	3.49	0
Insecta	Trichoptera	Apataniidae	0	0	0.474	0.873	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	2.04	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	2.15	21.6	4.27	3.49	5.65	2.96	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0.409	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	6.45	0.541	0.474	0.873	0.403	1.04	0	0	0	0	0	1.04
Insecta	Trichoptera	Rhyacophilidae	6.45	2.16	0.474	3.49	9.27	2.52	6.34	6.03	2.53	2.67	3.49	1.04
Insecta	Trichoptera	Uenoidae	0	0	0.474	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	1.08	0	0	0	0	0	0.862	0	0	0	0

Table G.7: Spearman Rank Correlations Between Benthic Invertebrate Endpoints and Water Quality Constituents with Early Warning Triggers, 2017 to 2022

Constituent	Dens (No. org	•	Total Bio (g/m ²		LPL Rich	iness	Family Ric	chness	%EP	т	%Ephemei	optera	%Pleco	otera	%Tricho	ptera	%Dipte	era
	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s	P-value	r _s
Antimony - Total (mg/L)	<0.001	0.278	0.103	0.118	0.0276	-0.159	<0.001	-0.361	<0.001	-0.436	0.00357	-0.209	<0.001	-0.300	<0.001	-0.366	<0.001	0.455
Barium - Total (mg/L)	<0.001	-0.488	<0.001	-0.287	0.00455	0.204	<0.001	0.325	<0.001	0.465	<0.001	0.257	<0.001	0.463	0.00288	0.214	<0.001	-0.434
Boron - Total (mg/L)	0.733	0.0248	0.137	0.108	0.00149	0.228	<0.001	0.258	0.00101	0.235	0.968	-0.00292	0.117	0.114	<0.001	0.335	<0.001	-0.281
Cadmium - Dissolved (mg/L)	0.280	0.0783	0.326	0.0713	0.153	0.103	0.624	-0.0356	0.0734	-0.130	0.731	0.0250	<0.001	-0.252	0.103	0.118	0.477	0.0517
Cobalt - Total (mg/L)	0.115	0.114	0.217	0.0896	0.496	0.0494	0.0100	-0.185	0.00508	-0.201	<0.001	-0.311	0.204	-0.0921	0.178	-0.0977	<0.001	0.242
Lithium - Total (mg/L)	0.270	0.0800	0.961	-0.00355	0.377	-0.0640	0.227	-0.0877	0.00174	-0.225	<0.001	-0.280	0.111	-0.115	0.187	-0.0956	<0.001	0.286
Manganese - Total (mg/L)	0.00106	0.235	0.0313	0.155	0.552	-0.0432	<0.001	-0.266	<0.001	-0.308	<0.001	-0.311	0.00111	-0.234	0.211	-0.0907	<0.001	0.251
Molybdenum - Total (mg/L)	<0.001	0.320	<0.001	0.272	0.639	-0.0341	0.997	0.00024	<0.001	-0.259	0.0513	0.141	<0.001	-0.332	0.420	-0.0585	0.0519	0.141
Nickel - Total (mg/L)	<0.001	0.286	0.317	0.0726	0.00361	-0.209	<0.001	-0.461	<0.001	-0.546	<0.001	-0.353	<0.001	-0.357	<0.001	-0.468	<0.001	0.594
Nitrate as N (mg/L)	<0.001	0.275	0.671	0.0308	<0.001	-0.275	<0.001	-0.496	<0.001	-0.517	<0.001	-0.388	<0.001	-0.306	<0.001	-0.512	<0.001	0.581
Nitrite as N (mg/L)	<0.001	0.265	<0.001	0.265	0.477	0.0516	<0.001	0.253	0.00783	-0.191	<0.001	0.280	<0.001	-0.400	0.0126	0.180	0.645	0.0335
Selenium - Total (mg/L)	<0.001	0.298	0.437	0.0564	<0.001	-0.280	<0.001	-0.500	<0.001	-0.590	<0.001	-0.420	<0.001	-0.392	<0.001	-0.470	<0.001	0.644
Sulfate (mg/L)	<0.001	0.302	0.417	0.0590	<0.001	-0.275	<0.001	-0.508	<0.001	-0.546	<0.001	-0.490	<0.001	-0.313	<0.001	-0.518	<0.001	0.611
Total Dissolved Solids (mg/L)	<0.001	0.320	0.249	0.0836	0.00144	-0.228	<0.001	-0.479	<0.001	-0.521	<0.001	-0.439	<0.001	-0.324	<0.001	-0.493	<0.001	0.589
Uranium - Total (mg/L)	<0.001	0.387	0.0525	0.140	<0.001	-0.266	<0.001	-0.501	<0.001	-0.637	<0.001	-0.488	<0.001	-0.426	<0.001	-0.484	<0.001	0.686
Zinc - Total (mg/L)	<0.001	0.364	<0.001	0.254	0.0518	-0.141	<0.001	-0.303	<0.001	-0.403	<0.001	-0.318	<0.001	-0.376	0.393	-0.0621	<0.001	0.316

P-value <0.05/n parameters = 0.05/16 = 0.00313.  $r_s \le -0.6$  or  $r_s \ge 0.6$ .

Notes: No. org./m² = number of organisms per square metre; g/m² = grams per square metre; LPL = Lowest Practical Level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera combined; rs = Spearman's correlation coefficient; mg/L = milligrams per litre; < = less than;  $\leq$  = less than or equal to;  $\geq$  = greater than or equal to.

Table G.8: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Calcite, Greenhills and Gardine Creeks, 2017 to 2022

Endpoint	Calcite	e Index	Concreti	on Score
Епаропп	r _s	p-value	r _s	p-value
Density (No. organisms/m²)	0.0208	0.775	-0.000652	0.993
Total Biomass (g/m²)	-0.268	<0.001	-0.289	<0.001
LPL Richness	-0.320	<0.001	-0.326	<0.001
Family Richness	-0.488	<0.001	-0.508	<0.001
%EPT	-0.484	<0.001	-0.467	<0.001
%Ephemeroptera	-0.479	<0.001	-0.477	<0.001
%Plecoptera	-0.233	0.00118	-0.211	0.00339
%Trichoptera	-0.590	<0.001	-0.603	<0.001
%Diptera	0.620	<0.001	0.615	<0.001

P-value <0.025 (0.05/2 for Bonferroni correction).  $r_s \le -0.6$  or  $r_s \ge 0.6$ .

Notes: rs = Spearman's correlation coefficient; No. organisms/m 2  = number of organisms per square metre;  $g/m^2$  = grams per square metre; < = less than; LPL = Lowest Practical Level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera combined;  $\le$  = less than or equal to;  $\ge$  = greater than or equal to.

Table G.9: Statistical Comparisons of Benthic Invertebrate Community Endpoints for Biological Monitoring Areas on Gardine Creek (RG_GAUT and RG_GANF), 2019 to 2022

Biological	Endpoints	Test ^a	Data	Test		M	СТ			MOD ^b	
Monitoring Area	Enupoints	rest	Transformation	P-value	2019	2020	2021	2022	2020	2021	2022
	Density (No./m²)	ANOVA	log ₁₀	<0.001	2,858	2,356	655	860	-0.28	-2.1	-1.7
	Total Biomass (g/m²)	ANOVA	log ₁₀	<0.001	1.79	7.27	0.925	1.12	2.4	-1.1	-0.79
	LPL Richness	ANOVA	log ₁₀	<0.001	20.8	30.3	15.7	21.4	4.0	-2.9	0.30
	Family Richness	ANOVA	log ₁₀	0.003	12.6	17.8	11.9	14.9	3.6	-0.56	1.8
RG_GAUT	%EPT	ANOVA	none	<0.001	85.0	55.1	77.8	78.2	-5.3	-1.3	-1.2
	%Ephemeroptera	K-W	rank	0.196	0.356	1.07	2.18	0.605	1.4	3.5	0.47
	%Plecoptera	ANOVA	none	0.002	83.5	42.7	58.5	62.3	-7.0	-4.3	-3.6
	%Trichoptera	ANOVA	none	0.016	1.06	10.2	16.3	12.7	11	18	14
	%Diptera	ANOVA	log ₁₀	0.005	9.86	30.7	10.1	8.58	4.7	0.077	-0.58
	Density (No./m²)	ANOVA	log ₁₀	0.054	1,133	2,011	1,200	604	0.56	0.055	-0.61
	Total Biomass (g/m²)	ANOVA	log ₁₀	0.045	0.490	2.11	0.996	0.558	1.0	0.49	0.090
	LPL Richness	ANOVA	none	0.002	17.3	29.3	21.3	17.7	1.9	0.64	0.054
	Family Richness	ANOVA	log ₁₀	0.011	11.2	18.6	16.3	12.1	1.2	0.88	0.19
RG_GANF	%EPT	ANOVA	log ₁₀	0.008	45.1	35.3	66.3	42.5	-0.72	1.1	-0.18
	%Ephemeroptera	K-W	rank	0.002	0.199	0	5.41	0	-0.67	18	-0.67
	%Plecoptera	ANOVA	none	0.070	45.7	31.2	49.7	39.2	-1.0	0.29	-0.46
	%Trichoptera	K-W	rank	0.010	1.08	4.03	5.78	3.08	4.4	7.0	3.0
	%Diptera	ANOVA	none	0.005	44.6	55.2	29.2	53.2	0.71	-1.0	0.57

P-value <0.1.

P-value <0.1 and MOD < -2.

P-value <0.1 and MOD >2.

Notes: MCT= Measure of Central Tendency; MOD = Magnitude of Difference; No./m² = number per square metre; ANOVA = Analysis of Variance; < = less than; g/m² = grams per square metre; LPL = Lowest Practical Level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera; K-W = Kruskal-Wallis; > = greater than; HSD = Honestly Significant Difference; M-W = Mann-Whitney; SD = standard deviation.

^a Statistical tests included an ANOVA followed by Tukey's HSD post hoc tests, or a K-W H-test followed by a M-W U-test.

 $^{^{\}rm b}$  MOD = (MCT_{later year} - MCT₂₀₁₉)/SD₂₀₁₉.

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	xon									Density							
											2016							
Higher Level	Classification	Family	Lowest Practical			RG G	SHUT					RG (	GHNF				RG_GHFF	
-			Level Identification	RG_GHUT-1	RG_GHUT-2			RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2			RG_GHNF-	RG_GHNF-6	RG_GHFF-1		RG_GHFF-
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	<b>5</b> 7	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	347	254	92	57	137	79	80	60	93	33	76	174	12	13	61
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata Euchelicerata	Trombidiformes Trombidiformes	Hygrobatidae Lebertiidae	Hygrobates Lebertia	32	0	46	0	20	0	0	20	27	7	12	44	24	17	23
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	13	0	36	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	32	0	46	0	0	20	13	0	0	0	0	0	6	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culiopidae	0	0	0	0	0	0	0	0	13	0	10	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Ceratopogonidae	Culicoides Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	159	0	23	0	0	86	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	446	91	115	170	102	172	41	7	27	87	19	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Diplocladius Eukiefferiella	0 223	114	137	0 284	0 508	0 388	0 41	7	0	0 18	19	0	0 69	0 66	196
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	09	00	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	45	0	0	0	0	0	7	40	7	86	131	6	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	64	0	0	341	0	0	14	158	0	0	0	566	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	1,814	432	115	625	407	452	232	239	667	131	1,095	958	1,004	607	1,339
Insecta	Diptera	Chironomidae	Pagastia	0	23	23	0	61	43	14	0	0	0	0	0	257	126	613
Insecta	Diptera	Chironomidae Chironomidae	Parametriocnemus	0	0	0	0	0	0	0 27	0 48	0	0	0 19	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae	Paraphaenocladius Pentaneura	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	32	0	23	227	0	43	0	0	0	0	0	0	6	0	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	64	0	0	0	0	43	55	139	0	7	0	131	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	127	136	46	0	41	86	137	48	53	7	106	218	44	17	0
Insecta	Diptera Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Dixidae Empididae	Dixa Chelifera/Metachela	0	22	0	0	0	0	80	7	27	34	67	87	96	77	53
Insecta	Diptera	Empididae	Clinocera	32	22	23	0	0	0	13	20	0	0	115	44	30	7	8
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	23	0	26	59	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	22	0	0	0	0	13	37	13	0	48	0	36	10	8
Insecta	Diptera	Psychodidae	Pericoma	63	0	115	170	0	59	13	13	13	0	0	131	12	0	0
Insecta	Diptera Diptera	Sciomyzidae Simuliidae	Sciomyzidae Simuliidae	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0
Insecta Insecta	Diptera	Stratiomyidae	Stratiomvidae	0	0	0	114	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	284	216	183	398	235	98	293	290	360	20	154	392	36	3	8
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	13	0	0	0	0	0	3	7
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Ephemeroptera Ephemeroptera	Ameletidae Baetidae	Ameletus Baetis	0	0	0	0	0	0 39	0	0	0	0	0	0	0	0	8
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	32	0	0	0	0	39	0	7	0	0	0	0	18	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Тах	on									Density							
			Lowest Practical								2016							
Higher Lev	vel Classification	Family	Level Identification			RG_	GHUT					RG_G	HNF				RG_GHFF	
			Level identification	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-	4 RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3
Insecta	Plecoptera	Capniidae	Capnia	158	85	0	114	0	20	80	53	67	123	67	131	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	347	317	252	1,705	275	197	347	110	133	53	134	915	42	3	8
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	23	0	0	0	13	0	27	17	10	0	6	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	57	0	0	0	0	0	7	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	63	21	23	398	353	414	80	13	13	0	10	305	42	13	15
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	42	23	0	0	0	187	163	347	33	267	392	0	7	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	3	0	0	3	0	0	0	27	17	0	0	6	10	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	158	21	0	57	39	0	0	30	0	7	19	0	36	7	107
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	21	0	170	0	20	0	0	0	10	10	0	0	10	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	32	0	0	227	78	20	0	0	13	7	10	0	36	13	8
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	63	0	0	0	0	0	0	0	0	0	0	0	39	13	69
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	kon									Density							
					2016							20	)17					
Higher Level	Classification	Family	Lowest Practical		RG_GHFF				RG	GHUT					RG	GHNF		
		_	Level Identification	RG GHFF-4	RG_GHFF-5	RG_GHFF-6	RG GHUT-	1 RG GHUT-2			RG GHUT-5	RG GHUT-6	RG_GHNF-	1 RG GHNF-2	_	_	RG GHNF-5	RG GHNF-6
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	195	48	8	160	280	97	303	90	80	0	10	57	37	23	17
Collembola	Collembola	- Llucio en la aceticia a a	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata Euchelicerata	Trombidiformes Trombidiformes	Hydryphantidae Hygrobatidae	Wandesia Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	21	0	10	0	0	0	3	0	0	0	0	7	0	3
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	10	0	0	0	0	0	0	0	0	0	3
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	10	0	33	0	0	0	0	0	0	0	3
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0	3	10	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Ceratopogonidae	Ceratopogonidae Culicoides	0	0	0	10	0	0	0	3	0	0	0	7	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	20	0	35	0	21	4	0	7	0	4	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	7	0	35	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Corynoneura Diamesa	0	0	0	0 432	7 209	0 112	0 458	170	0 376	0 29	9	53	99	0 26	0 51
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	274	93	125	0	131	116	884	82	134	14	4	7	9	48	12
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	34	37	11	70	24	21	0	127	42	9	11	12
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	0	0	0	4	35	20	63	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Orthocladius complex Pagastia	1,299 957	1,486 380	602 258	1,720 105	798 50	576 49	3,427 458	514 82	1,423 207	0	39	182 0	0	37 0	71
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	29	9	0	74	28	178	61	74	0	0	42	0	0	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	14	0	10	0	0	0	0	0	0	0	7	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae	Thienemanniella Tvetenia	114	151	39	95	81	14	248	31	11	69	4	0	0	66	31
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	119	103	17	10	7	0	0	0	0	0	20	0	17	3	0
Insecta	Diptera	Empididae	Clinocera	43	28	8	10	7	3	0	10	20	0	0	0	0	0	3
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	10	13	10	0	3	0	3	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Muscidae Pelecorhynchidae	Muscidae Glutops	0	0	0	0	0	0	33	0	40 0	0	7	7	7	3	0
Insecta	Diptera	Pelecornynchidae Psychodidae	Pericoma	11	14	0	23	30	3	100	10	30	0	7	50	3	13	7
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	11	0	0	23	0	0	0	0	10	3	0	0	0	10	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	54	34	0	70	137	77	473	30	90	7	7	323	13	33	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	3	0	0	3	0	0	0	0	0	7	0	0	0
Insecta Insecta	Diptera Diptera	Tipulidae Tipulidae	Molophilus Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	13	0	0	0	0	3	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	11	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	3	0	7	0	3

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	con									Density							
			Lowest Practical		2016							20	17					
Higher	Level Classification	Family	Level Identification		RG_GHFF				RG_0	SHUT					RG_0	SHNF		
			Level identification	RG GHFF-4	RG GHFF-5	RG GHFF-6	RG GHUT-1	RG GHUT-2			RG_GHUT-5	RG GHUT-6	RG GHNF-1	RG GHNF-2	RG GHNF-3	RG GHNF-4	RG GHNF-5	RG GHNF-6
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	33	20	3	203	20	40	40	17	373	 17	103	127
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	65	14	8	893	270	200	3,740	200	257	140	167	1,217	287	663	773
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	7	0	67	13	10	0	0	0	13	0	3
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	13	0	33	10	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	7	0	0	0	0	0	0	0	0	3	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	65	75	41	80	30	17	170	80	227	0	0	0	3	27	37
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	76	96	17	0	0	0	0	0	0	33	27	40	3	13	20
Insecta	Plecoptera	Perlodidae	Megarcys	14	0	4	0	0	0	67	3	20	0	3	0	0	0	3
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	141	21	58	10	0	10	33	3	0	17	0	0	0	7	17
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	7	12	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	11	41	4	0	7	10	0	40	60	0	0	17	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	14	17	23	0	3	33	0	0	0	0	0	3	0	0
Malacostrac	ca Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

Higher Level Classification									Density							
Clitellata Tubificida Naididae Clitellata Tubificida Naididae Clitellata - Enchytraeidae Collembola - Enchytraeidae Collembola - Enchytraeidae Euchelicerata Trombidiformes Hydryphantidae Euchelicerata Trombidiformes Hydryphantidae Euchelicerata Trombidiformes Lebertiidae Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Staphylinidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomi				201	7							2018				
Clitellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata Cittellata	Lowest Practical			RG G						RG	GHUT				RG GHNF	
Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltellata Ciltelmbola Ciltembola Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae In	Level Identification	RG GHFF-1	1 RG GHFF-2	_		RG GHFF-5	RG GHFF-6	RG GHUT-1	RG GHUT-2	_		RG GHUT-5	RG GHUT-6	RG GHNF-1	_	RG GHNF-3
Ciltellata Collembola Collembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Culembola Coleoptera Culembola Coleoptera Coleoptera Culembola Coleoptera Coleoptera Culembola Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Coleoptera Co	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola Collembola Euchelicerata Trombidiformes Hydryphantidae Euchelicerata Trombidiformes Lebertiidae Euchelicerata Trombidiformes Lebertiidae Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Sperchontidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sci	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata Trombidiformes Hygrophantidae Euchelicerata Trombidiformes Hygrobatidae Euchelicerata Trombidiformes Lebertidae Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta	Enchytraeidae	7	0	7	10	0	3	240	800	53	27	640	320	0	0	160
Euchelicerata Trombidiformes Lebertiidae Euchelicerata Trombidiformes Lebertiidae Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sim	Collembola	0	0	0	0	0	0	0	0	80	0	0	0	53	27	0
Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Sperchontidae Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Staphylinidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata Trombidiformes Torrenticolidae Euchelicerata Trombidiformes Torrenticolidae Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sci	Hygrobates Lebertia	0	0	3	0 10	0	7	0	0	0	0	0	0	0	0	0
Euchelicerata Trombidiformes Insecta Coleoptera Dytiscidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Dipt	Sperchon	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Coleoptera Elmidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Coleoptera Staphylinidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae	Heterlimnius	0	0	0	0	0	0	0	0	0	0	53	0	0	0	0
Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Inse	Narpus	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0
Insecta Diptera Ceratopogonidae Insecta Diptera Ceratopogonidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Schoromidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Schoromidae Insecta Diptera Schoromidae Insecta Diptera Schoromidae Insecta Diptera Schoromidae Insecta Diptera Schoromidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Strationyidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Stratiomyidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Culicoides Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Sixiado Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sixiadiomyzidae Insecta Diptera Sixiadiomyzidae Insecta Diptera Sixiadiomyzidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Sciomyzidae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Sixidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sixuliidae Insecta Diptera Sixuliidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Brillia	3	0	0	0	0	11	97	0	33	107	203	192	139	759	53
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Simulidae Insecta Diptera Empididae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Chaetocladius	0	0	0	0	0	0	97	0	0	0	68	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Simulidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insecta Insect	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	64	0	28	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Diamesa	14	10	14	25	0	11	0	61	0	0	0	1,280	28	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Diplocladius	0	0	0	0	0	0	0	0	0	36	0	64	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Eukiefferiella Heleniella	3	17	0	32 0	10 0	7	552 0	1,280 0	329 0	286 0	4,737 0	2,944	388	197 0	107 0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Hydrobaenus	0	0	0	0	0	0	325	61	559	0	135	0	0	225	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Fempididae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Limnophyes	0	0	0	0	0	0	0	01	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Fepididae Insecta Diptera Empididae Insecta Diptera Simuliidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Micropsectra	3	48	4	42	0	25	32	0	0	0	135	64	0	28	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Orthocladius complex	367	360	190	486	197	372	649	853	361	1,285	1,692	960	166	84	133
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Pagastia	232	367	176	342	92	207	65	61	33	143	0	128	55	28	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Pentaneura Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Pseudodiamesa	0	7	0	4	17	0	292	0	230	0	880	576	0	56	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Dixidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Fempididae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae Insecta Diptera Chironomidae Insecta Diptera Dixidae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Pelecorhynchidae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Chironomidae  Insecta Diptera Dixidae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Muscidae  Insecta Diptera Pelecorhynchidae  Insecta Diptera Psychodidae  Insecta Diptera Sciomyzidae  Insecta Diptera Sciomyzidae  Insecta Diptera Stratiomyidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Dixidae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Empididae  Insecta Diptera Muscidae  Insecta Diptera Pelecorhynchidae  Insecta Diptera Psychodidae  Insecta Diptera Sciomyzidae  Insecta Diptera Sciomyzidae  Insecta Diptera Stratiomyidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae  Insecta Diptera Tipulidae	Tvetenia	0	10	0	4	3	11	130	244	296	464	1,963	128	1,997	1,715	267
Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Muscidae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Empididae Insecta Diptera Muscidae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Dixa Chalifora/Mataghala	0	0	0	0 57	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Empididae Insecta Diptera Muscidae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Chelifera/Metachela Clinocera	20	47 3	20 0	57 0	20 3	33 0	0 27	0	27	0 53	0	0	0	0	0
Insecta Diptera Muscidae Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Wiedemannia	7	7	0	7	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Pelecorhynchidae Insecta Diptera Psychodidae Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Muscidae	0	0	0	0	0	0	0	0	0	0	107	0	0	0	27
Insecta Diptera Sciomyzidae Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae		0	23	0	3	0	7	0	0	0	0	0	0	0	0	0
Insecta Diptera Simuliidae Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Pericoma	0	3	0	3	0	0	0	53	187	27	320	0	133	53	187
Insecta Diptera Stratiomyidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Antocha Dicranota	10	30	10	13	0	23	880	373	187	427	747	267	293	213	427
Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	293	0	0
Insecta Diptera Tipulidae Insecta Diptera Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
Insecta Diptera Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhabdomastix	0	10	0	3	0	0	0	0	0	0	0	0	0	0	0
	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Ephemeroptera Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Ephemeroptera Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Ephemeroptera Ephemerellidae Insecta Ephemeroptera Heptageniidae	Ephemerellidae Cinygmula	13	3 17	7	3	3	3 27	0 27	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Тах	con									Density							
			Lowest Practical			20	)17							2018				
Higher	r Level Classification	Family	Level Identification			RG	GHFF					RG_0	SHUT				RG_GHNF	
			Lever identification	RG GHFF-1	RG GHFF-2			RG GHFF-5	RG GHFF-6	RG GHUT-1	RG_GHUT-2			RG GHUT-5	RG GHUT-6	RG GHNF-1		RG GHNF-3
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	80	0	0	0	0	53	27	133	53
Insecta	Plecoptera	Capniidae	Paracapnia	23	147	23	33	0	43	1,520	427	773	427	2,027	533	693	1,307	613
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	10	0	3	0	0	53	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	10	3	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	13	90	43	60	3	50	53	107	27	0	320	480	133	27	80
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	3	7	0	0	27	0	80	27	53	0	107	107	187
Insecta	Plecoptera	Perlodidae	Megarcys	20	17	13	33	0	23	0	0	0	0	53	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	60	23	3	60	13	133	0	0	0	0	0	53	107	27	53
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	3	0	0	0	7	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	3	0	7	7	3	3	0	0	27	0	107	0	27	27	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	13	23	20	33	3	17	27	0	0	0	0	0	0	0	0
Malacostra	aca Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	xon									Density							
								2018							20	019		
Higher Level	Classification	Family	Lowest Practical		RG GHNF		1	2010	RG	GHFF						GHUT		
90			Level Identification	RG GHNF-4	4 RG_GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2			RG GHFF-5	RG GHFF-6	RG GHUT-1	1 RG GHUT-2			RG GHUT-5	RG GHUT-6
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	53	0	7	0	0	0	7	7	213	400	40	133	227	433
Collembola	Collembola	=	Collembola	453	27	27	0	0	0	13	0	0	0	0	53	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Euchelicerata Euchelicerata	Trombidiformes Trombidiformes	Hygrobatidae Lebertiidae	Hygrobates Lebertia	0	27	0	0	0	3	0	0	3	0	0	13	13	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	7	0	3	0	0	0	0	0	0	13	0	7
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0	0	7	0	0	0	0	13	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Ceratopogonidae	Culicoides Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	170	383	270	0	0	0	0	0	0	0	0	28	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	135	0	0	0	21	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Diplocladius Eukiefferiella	0	118	0 135	63	0 98	72	0 21	0 49	23	975	993	0 266	0 557	0 675	28 2,013
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	90	0	0	0	0	0	993	0	0	0/5	2,013
Insecta	Diptera	Chironomidae	Hydrobaenus	28	0	0	0	0	0	0	0	0	271	827	883	70	55	28
Insecta	Diptera	Chironomidae	Limnophyes	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	0	14	0	3	0	0	0	0	0	28	0	14	0
Insecta	Diptera	Chironomidae	Orthocladius complex	57	88	135	797	922	538	524	480	317	1,300	1,048	308	1,059	1,019	340
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	571	671	179	478	371	298	379	386	112	348	234	451
Insecta	Diptera	Chironomidae Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae	Paraphaenocladius Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	28	0	0	0	0	0	0	0	0	54	221	210	14	41	28
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	1,047	531	757 0	7	56 0	7	25 0	56 0	23	433	552 0	98	125 0	69	87 0
Insecta Insecta	Diptera Diptera	Chironomidae Dixidae	Zavrelimyia Dixa	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	67	53	10	13	13	73	0	27	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	73	13	20	17	3	10	0	0	40	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	108	0	0	0	0	0	0	0	0	0	0	0	13
Insecta	Diptera	Pelecorhynchidae	Glutops	0	27	0	0	0	7	3	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	27	80	243	0	0	0	10	0	7	53	133	160	53	27	27
Insecta	Diptera Diptera	Sciomyzidae Simuliidae	Sciomyzidae Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	187	107	162	73	13	17	17	10	47	267	187	187	160	107	73
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	27	0	0	7	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Ephemeroptera	Tipulidae Ameletidae	Tipula Ameletus	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	27	0	0	0	13	7	0	0	0	13	13	0
	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	20	0	13	10	10	7	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	con									Density							
			Lowest Practical					2018							20	119		
Higher	Level Classification	Family	Level Identification		RG_GHNF				RG_0	SHFF					RG_	GHUT		
			Leveridentification	RG GHNF-4	RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2	RG_GHFF-3	RG GHFF-4	RG GHFF-5	RG GHFF-6	RG GHUT-1	RG GHUT-2	RG GHUT-3	RG GHUT-4	RG GHUT-5	RG GHUT-6
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	53	27	80	0	0	3	0	0	0	53	53	13	0	53	7
Insecta	Plecoptera	Capniidae	Paracapnia	507	320	587	233	93	47	23	47	33	507	347	227	240	107	113
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	13	3	0	17	10	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	7	0	0	0	0	3	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	13	0	47
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	27	187	133	627	840	477	310	187	153	53	53	67	160	80	113
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	53	133	80	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	33	53	20	13	27	57	27	0	0	3	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	7	13	3	7	7	10	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	80	187	140	253	113	50	43	50	80	107	0	13	13	13
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	13	0	0	10	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	13	3	0	0	0	0	0	67	0	0	27
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	27	67	80	27	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	13	53	17	3	27	13	0	0	0	7	13	0
Malacostrac	ca Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	kon									Density							
									20	19							2020	
Higher Level (	Classification	Family	Lowest Practical			RG_G	HNF					RG	GHFF				RG_GHUT	
			Level Identification	RG GHNF-1	RG GHNF-2	RG_GHNF-3		RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2	_		RG GHFF-5	RG GHFF-6	RG GHUT-1	_	RG GHUT-3
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	27	13	0	3	3	0	120	0	3	0	100	10	347	293	267
Collembola	Collembola	-	Collembola	0	27	0	7	60	293	13	0	3	3	0	3	0	40	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	3	27	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	0	0	3	3	7	0	27	0	53
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	53	0	3	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae Elmidae	Heterlimnius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera		Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Coleoptera Diptera	Staphylinidae Ceratopogonidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	30	28	15	25	29	0	0	0	0	0	0	0	108	55
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	4	0	0	0	56	92	274
Insecta	Diptera	Chironomidae	Diamesa	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	141	105	444	7	25	200	1,544	128	165	270	920	404	790	62	766
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	141	15	444	11	8	114	76	0	254	0	56	31	113	523	985
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	28	0	0	0	45	0	16	0	16	12	113	77	274
Insecta	Diptera	Chironomidae	Orthocladius complex	226 735	179 30	222	11	4	57	363	8	40 57	76	120 1,767	31 602	1,523	431	547
Insecta	Diptera Diptera	Chironomidae Chironomidae	Pagastia Parametriocnemus	0	0	250	0	0	143 0	2,316 0	78 0	0	113 0	0	0	705 0	15 0	164
Insecta Insecta	Diptera	Chironomidae	Parametriochemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	28	0	166	7	0	57	30	0	40	0	0	4	28	62	492
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	9,580	986	7,991	152	58	5,664	666	12	16	8	208	66	113	92	657
Insecta	Diptera	Chironomidae	Zavrelimyia	0	15	28	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	53	0	0	3	0	27	147	13	0	7	80	27	40	27	0
Insecta	Diptera	Empididae	Clinocera	27	13	0	10	0	0	0	7	3	17	67	3	40	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
Insecta	Diptera	Psychodidae	Pericoma	400	108	133	40	20	480	80	0	3	7	13	20	53	200	1,120
Insecta	Diptera	Sciomyzidae Simuliidae	Sciomyzidae Simuliidae	0	13	0	23	0 17	0 80	0	0	0	0	0	7	0 27	0	0
Insecta Insecta	Diptera Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	133	0	53	3	0	160	267	0	13	0	147	17	400	163	1,227
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	3	0	0	0	0	0	0	0	0	27	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	13	0	0	0	0	27	0	0	0	13	0	27	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	3	0	0	0	3	0	7	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	con									Density							
			Lowest Practical						20	)19							2020	
Higher L	_evel Classification	Family	Level Identification			RG_0	SHNF					RG_	GHFF				RG_GHUT	
			Level identification	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	133	160	213	90	33	320	0	0	0	0	0	0	0	80	0
Insecta	Plecoptera	Capniidae	Paracapnia	427	160	827	230	57	693	133	3	33	10	213	10	213	53	907
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	13	0	0	0	0	13	0	0	3	7	0	0	13	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	3	0	0	0	0	0	0	53
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	7	0	0	0	0	0	0	7	0	0	373
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	133	387	853	167	30	613	1,773	143	87	103	1,307	310	80	27	0
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	133	67	80	23	10	107	13	3	0	0	40	3	0	13	160
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	3	0	3	7	0	10	7	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	27	67	53	33	13	53	40	17	3	10	13	13	0	0	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	67	107	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	13	803
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	10	10	0	13	0	13	3	0	7	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	43	7	0	10	7	3	0	0	0
Malacostraca	a Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	xon									Density							
			Lowest Practical								2020							,
Higher Level (	Classification	Family	Level Identification		RG_GHUT				_	GHNF					_	GHFF		
					-4 RG_GHUT-5		_			_							<del></del>	
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata Clitellata	Tubificida	Naididae Enchytraeidae	Tubificinae Enchytraeidae	0 293	240	1.707	107	67	53	0	80	0 27	0 80	0	7	67	7	0 67
Collembola	Collembola	- Encriytraeidae	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	13	0	13	13	40	7	0	13	27
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Coleoptera	Elmidae Elmidae	Heterlimnius Narpus	0	27	107 0	0	0	0	0	0	0	13	0	0	0	7	40
Insecta	Coleoptera Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	14	0	13	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	30	61	0	0	14	0	0	14	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura Diamesa	60 91	91	113 113	126 0	69 0	0	0	130	64 0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	634	1,067	5,649	126	14	34	15	0	32	123	115	142	29	97	111
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	315	14	51	0	58	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	694	1,554	1,243	441	263	0	15	115	0	165	115	0	462	14	111
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	754	1,737	904	63	0	0	0	14	0	178	29	14	0	14	28
Insecta	Diptera	Chironomidae	Orthocladius complex	121	1,310	3,954	63	0	17	0	0	0	370	288	654	881	839	319
Insecta	Diptera	Chironomidae	Pagastia	211	427	3,276	126 0	0	0	0	0	0	1,001	620	1,180 0	823 0	562 0	2,306 0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Parametriocnemus Paraphaenocladius	0	0	0	0	0	17	0	0	0	0	0	0	14	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	272	274	339	189	152	0	0	43	0	41	14	0	0	14	28
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	573	305	1,582	1,324	166	0	194	29	64	55	58	36	58	0	97
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	28	0	0	14	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Dixidae Empididae	Dixa Chelifera/Metachela	0	0	0	0 160	53	133	0 56	14 27	13	0 293	0 262	206	320	92	0 253
Insecta	Diptera Diptera	Empididae	Clinocera	0	0	0	0	0	133	28	0	0	13	18	14	0	8	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	107	53	13	0	54	0	80	0	0	27	7	0
Insecta	Diptera	Psychodidae	Pericoma	613	933	2,133	267	80	133	98	54	13	173	0	0	160	27	40
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Tipulidae Tipulidae	Antocha Dicranota	0 350	0 880	1,387	2,027	280	347	140	338	0 253	0 80	0 80	13	200	40	133
Insecta	Diptera Diptera	Tipulidae	Limnophila	0	000	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	27	0	0	0	0	0	0	0	67	107	27	93	40	53
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	con									Density							
			Lowest Practical								2020		_					-
Higher Le	evel Classification	Family	Level Identification		RG_GHUT					GHNF						GHFF		
				RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	98	0	409	1,542	175	201	91	45	124	0	122	0	17	0	29
Insecta	Plecoptera	Capniidae	Paracapnia	782	907	2,044	1,285	491	345	136	728	249	173	305	7	117	20	345
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	27	0	0	0	0	27	0	0	0	13	0	0	0	7	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	27	13	0	0	0	0	13	0	0	7	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	293	0	0	120	0	0	31	165	0	0	14	39
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	347	240	640	293	53	53	120	0	173	1,009	2,035	380	800	193	2,161
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	80	0	0	320	67	93	120	40	40	13	20	0	20	0	16
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0	0	27	60	20	20	0	64
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	13	0	13	0	13	0	53	7	40
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	107	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	80	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	693	1,413	853	53	53	27	13	53	0	107	0	53	13	0	80
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	3	0	0	0	0	0	0	27	120	13	13	0	53
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Тах	xon									Density							
			Lowest Practical								2021							'
Higher Level	Classification	Family	Level Identification			RG_	GHUT					RG_0	SHNF				RG_GHFF	
			20101140114110441011	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	432	132	216	120	24	144	120	96	0	0	48	48	0	6	6
Collembola	Collembola	- Lludwinhoutides	Collembola	0	0	0	0	0	0	0	0	0	48	12	24	0	3	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata Euchelicerata	Trombidiformes Trombidiformes	Hygrobatidae Lebertiidae	Hygrobates Lebertia	24	0	48	0	0	24	0	0	0	24	0	0	36	6	24
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	24	0	24	24	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Élmidae	Heterlimnius	24	120	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	116	0	29	0	0	80	0	52	206	29	0	26	0	0	0
Insecta	Diptera	Chironomidae	Chiranamus	0	0	0	0	0	0	0	0	0	0	0	185	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Chironomus Corynoneura	0 58	0	0 58	0 54	0	0	0 26	104	0 51	0 29	26	0 185	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	51	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	6,325	2,478	2,324	4,129	3,459	3,107	79	0	0	29	0	0	1,259	873	373
Insecta	Diptera	Chironomidae	Heleniella	0,020	0	0	0	0	0,107	52	208	51	0	0	79	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	29	0	0	0	0	260	0	0	0	132	0	15	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	29	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	58	0	0	0	0	0	26	208	51	0	0	371	0	177	7
Insecta	Diptera	Chironomidae	Orthocladius complex	347	507	581	751	195	186	315	52	154	29	40	212	364	29	41
Insecta	Diptera	Chironomidae	Pagastia	1,126	718	581	885	335	372	2,073	520	1,543	57	675	715	1,161	265	210
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Polypedilum Pseudodiamesa	0	70	349	0 80	0 28	0	0 52	0 312	206	0	13	79	0	0	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	70	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	347	42	58	54	112	0	3,805	5,099	7,766	713	410	6,247	0	15	0
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	60	0	0	0	0	360	144	72	24	132	96	228	24	126
Insecta	Diptera	Empididae	Clinocera	72	0	48	48	0	96	72	0	72	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	120	0	0	24	0	24	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	3	0	48	0	0	0	0	0	6	0
Insecta	Diptera	Psychodidae	Pericoma	312	192	360	96	312	336	120	864	432	144	48	528	0	54	18
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Insecta Insecta	Diptera Diptera	Simuliidae Stratiomyidae	Simuliidae Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	192	156	192	144	168	144	336	144	576	48	132	648	0	3	6
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	24	0	0	0	0	0	0	0	0	6
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	con									Density							
			Lowest Practical								2021							
Higher L	evel Classification	Family	Level Identification			RG_0	SHUT					RG_	GHNF				RG_GHFF	
			Level identification	RG GHUT-1	RG GHUT-2			RG GHUT-5	RG_GHUT-6	RG GHNF-1	RG GHNF-2	RG GHNF-3	RG GHNF-4	RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2	RG GHFF-3
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	41	0	0	0	0	34	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	450	84	336	126	48	343	293	246	79	40	167	1,606	0	0	12
Insecta	Plecoptera	Capniidae	Paracapnia	613	24	168	42	48	103	763	2,538	2,225	80	229	1,874	0	6	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	24	0	0	0	24	0	0	24	0	0	0	0	6
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	96	0	24	0	72	0	56	88	172	0	41	0	0	9	0
Insecta	Plecoptera	Nemouridae	Visoka	96	0	24	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	768	48	48	168	0	336	1,792	1,592	1,460	528	367	768	240	45	228
Insecta	Plecoptera	Peltoperlidae	Yoraperla	24	12	0	0	24	48	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	144	72	240	24	144	312	408	624	48	120	13	288	12	0	6
Insecta	Plecoptera	Perlodidae	Megarcys	24	0	0	24	0	0	3	0	0	0	203	24	0	6	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	48	0	0	0	48	72	96	96	240	48	72	168	48	24	12
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	36	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	48	84	264	384	456	360	144	384	48	216	60	0	0	18	18
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	48	0	0	24	0	48	0	0	0	0	0	0	12	3	30
Malacostraca	a Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon									Density							
		Tuxon			0004						Donoity	000						
11:	ar Laval Classification	Family	Lowest Practical		2021					O		20:	22			OLINE.		
nigi	ner Level Classification	Family	Level Identification		RG_GHFF	DC CHEE'S	PG GHIIT.1	PG GHIIT-2		GHUT	DG GHIIT-E	PG GHIIT.6	PG GUNE-1	PG GHNE-2	_	GHNF	RG GHNF-5	DG GHNE 6
Clitella	ata Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0
Clitella		Naididae	Tubificinae	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0
Clitella		Enchytraeidae	Enchytraeidae	6	24	96	720	36	3	24	48	72	336	144	3	48	48	48
Collemi		-	Collembola	0	0	0	0	0	3	0	0	0	24	0	3	0	0	0
Euchelic		Hydryphantidae	Wandesia	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelic Euchelic		Hygrobatidae Lebertiidae	Hygrobates Lebertia	12	24	36	12	0	0	0	0	0	24	0	0	0	0	0
Euchelic		Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Euchelic	erata Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Elmidae	Heterlimnius	0	0	0	0	0	0	6	12 0	48 0	0	0	0	0	0	0
Insec		Elmidae Staphylinidae	Narpus Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	3	0	144	0
Insec		Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Ceratopogonidae	Probezzia	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0
Insec		Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Chironomidae	Boreoheptagyia	0	0	0	0	0 13	6	0	0	0	0	0	10	0 49	0	0
Insec		Chironomidae Chironomidae	Brillia Chaetocladius	0	0	0	0	0	0	0	14 0	0	0	0	0	49 0	51 0	0
Insec		Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Chironomidae	Corynoneura	0	0	0	13	0	0	0	0	0	26	0	0	0	0	0
Insec	ta Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	14	30	0	0	0	0	0	0
Insec	•	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Chironomidae	Eukiefferiella	917	1,513	1,521	1,159	307	3	51	413	2,929	51	0	5	0	51	0
Insec		Chironomidae Chironomidae	Heleniella Hydrobaenus	0	0	95	0 154	0 64	0 55	0 22	0 234	0 269	485 434	70 187	0	0 296	0	49 881
Insec		Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	ta Diptera	Chironomidae	Micropsectra	0	42	109	0	0	0	0	0	30	51	23	0	0	0	0
Insec		Chironomidae	Orthocladius complex		113	652	760	115	0	7	0	508	51	0	5	49	51	0
Insec		Chironomidae	Pagastia	476	551 0	1,712	386 0	166	0	0	138	747 0	0	0	26 0	395 0	973	245 0
Insec		Chironomidae Chironomidae	Parametriocnemus Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Chironomidae	Pseudodiamesa	0	0	27	129	80	29	94	207	418	230	23	0	198	0	735
Insec		Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Chironomidae Chironomidae	Thienemanniella Tvetenia	0	0	0	0 51	0 51	0	0 58	0 289	0 60	0 1,020	0 47	0 88	0 4,052	0 8.041	0 5,386
Insec		Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	102	70	0	0	0	0
Insec	'.	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	•	Empididae	Chelifera/Metachela	84	156	432	12	0	0	12	0	72	192	252	35	144	192	320
Insec		Empididae	Clinocera	0	0	0	0	24	9	12	45	0	0	0	0	0	0	64
Insec	·	Empididae Muscidae	Wiedemannia Muscidae	0	0	0	0	0	0	0	15 0	0	0	0	0	0	0	0
Insec	•	Pelecorhynchidae	Glutops	0	0	0	0	0	3	0	0	0	192	165	3	0	0	57
Insec		Psychodidae	Pericoma	18	84	144	96	72	69	132	456	504	96	84	9	96	288	48
Insec	ta Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Simuliidae	Simuliidae	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec	·	Tipulidae Tipulidae	Antocha Dicranota	0	0 12	0	0	0 60	0 24	0 18	0 12	0 96	0 144	12	0 6	96	0 48	0 144
Insec	·	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Insec	·	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Tipulidae	Tipula	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0
Insec		Ameletidae Baetidae	Ameletus Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Ephemerellidae	Ephemerellidae	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Insec		Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Та	xon									Density							
			Lowest Practical		2021							20	)22					
High	er Level Classification	Family	Level Identification		RG GHFF				RG_0	SHUT					RG_C	HNF		
			Leveridentification	RG GHFF-4	RG GHFF-5	RG GHFF-6	RG GHUT-1	RG GHUT-2			RG_GHUT-5	RG GHUT-6	RG GHNF-1	RG GHNF-2	RG GHNF-3	RG GHNF-4	RG GHNF-5	RG GHNF-6
Insect	a Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Plecoptera	Capniidae	Mesocapnia	0	0	36	0	36	36	30	168	572	52	0	15	555	0	0
Insect	a Plecoptera	Capniidae	Paracapnia	0	12	0	456	36	0	0	84	172	1,244	72	0	741	288	2,064
Insect	a Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	24	0	0	0	0	24	48	0	0	0	0
Insect	a Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	24	0	12	0	0	0	0
Insect	a Plecoptera	Nemouridae	Malenka	18	0	81	0	0	0	0	0	0	48	0	0	0	0	144
Insect	a Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Plecoptera	Nemouridae	Zapada	96	300	423	36	0	0	6	0	192	0	12	12	96	0	0
Insect	a Plecoptera	Peltoperlidae	Yoraperla	0	0	0	24	12	6	0	24	24	0	0	0	0	0	0
Insect	a Plecoptera	Perlodidae	Isoperla	0	12	36	12	36	30	30	96	288	696	156	110	1,488	816	1,440
Insect	a Plecoptera	Perlodidae	Megarcys	6	0	0	0	12	0	0	24	24	0	0	28	3	0	3
Insect	a Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Plecoptera	Taeniopterygidae	Taeniopterygidae	72	48	120	12	24	0	0	0	0	0	12	0	0	48	0
Insect	a Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0
Insect	a Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Limnephilidae	Limnephilidae	0	48	0	0	0	27	6	132	168	0	120	3	0	0	0
Insect	a Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insect	a Trichoptera	Rhyacophilidae	Rhyacophilidae	6	12	0	0	0	3	0	0	0	0	0	0	0	0	0
Malacost	raca Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Tax	xon								sity					
			Lowest Practical						20	22					
Higher Level	Classification	Family	Level Identification			RG_GHF						_	GHDT		
Clitellata	Tubificida	Naididae	Nais communis	<b>RG_GHFF-1</b> 0	RG_GHFF-2	RG_GHFF-3 RG	0 0	0 RG_GHFF-5	<b>RG_GHFF-6</b>	RG_GHD1-1	0 RG_GHD1-2	0 RG_GHD1-3	RG_GHD1-4	0 RG_GHD1-5	0 RG_GHD1-6
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	21	0	6	15	51	108	0	0	0	6	6	6
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	12	6	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	6	6	3	12	0	6	0	6	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	3	3	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	6	0	12	12	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culiosidas	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Ceratopogonidae Ceratopogonidae	Culicoides Probezzia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	4	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	7	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	4	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	400	0	530	109	468	1,007	218	663	375	54	142	134
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	3	0	0	11	0	28	82	0	0	11	7	4
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	4	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	17	0	0	35	7	248	14	0	0	7	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Orthocladius complex	27 143	0	50 129	74 46	82 386	441 1,489	14 41	21 137	79 16	11 47	54 162	32 46
Insecta	Diptera	Chironomidae	Pagastia Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	4	0	14	0	0	0	4	0	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	28	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	10	0	14	7	71	441	41	103	7	18	74	28
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	7	0	4
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	3	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	53	0	45	73	90	456	72	36	3	33	48	15
Insecta	Diptera	Empididae Empididae	Clinocera Wiedemannia	11 0	0	0	5 0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	3	0	3	9	0	12	12	0	0	3	18	3
Insecta	Diptera	Psychodidae	Pericoma	15	0	9	150	66	288	48	0	3	15	24	6
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	0	0	0	3	60	0	6	0	3	12	3
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae Ephemerellidae	Baetis	0	0	0	6	0	0	0	0	0	3	0	0
Insecta	Ephemeroptera Ephemeroptera	Heptageniidae	Ephemerellidae Cinygmula	3	0	0	0	18 6	0	0	0	0	0	0	0
Insecta	приетнегориета	періаденнаве	Ciriyginula	J	U	U	U	Ü	U	U	U	U	U	U	U

Table G.10: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

	Ta	xon							Den	sity					
			Lowest Practical						20	22					
Higher Leve	l Classification	Family	Level Identification			RG_	_GHFF					RG_	GHDT		
			Leveridentineation	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHDT-1	RG_GHDT-2	RG_GHDT-3	RG_GHDT-4	RG_GHDT-5	RG_GHDT-6
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	16	18	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	12	0	3	15	3	48	32	0	3	24	66	12
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	15	6	12	0	0	0	0	6	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	108	0	48	51	126	228	48	60	12	24	6	36
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	7	0	12	6	45	144	72	77	3	27	6	6
Insecta	Plecoptera	Perlodidae	Megarcys	11	0	0	30	3	48	0	10	18	0	24	9
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	6	0	3	3	27	72	48	54	18	3	30	9
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	3	0	0	0	0	0	0	0	0	0	0	3
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	12	6	0	9	48	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	15	0	9	9	12	0	24	6	3	0	30	6
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	15	0	0	24	18	48	24	0	0	3	6	3
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0

Notes: No./m²= number of organisms per square me Note: " - " indicates no data available

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three	-minute Kick Sa	amples					
			Lowest Practical Level	2012		2	014			20	15			2021		2022
Higher Level	Classification	Family	Identification	RG_GHCKU		GRE	E4-25			GRE	E3-75			RG_GHNF		RG_GHNF
	1			RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1		GREE4-75-1	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-1
Clitellata	Tubificida	Naididae	Nais	0	0	1.13	0	0.289	0	0	0.254	0.338	0	0.496	0.605	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0.643
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0.946	0.761	0.338	0	0	0	1.29
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0.847	0	0.403	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0.289	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0.156	0.289	0.287	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0.156	0	0.287	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0.313	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0.338	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0.156	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0.254	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0.157	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0.333	0	0.379	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0.482	0.306	0	0	0	0	0.726	1.12	0.226	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0.306	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0.726	0.279	0	0
Insecta	Diptera	Chironomidae	Diamesa	89.0	10.8	5.27	51.7	20.2	0.985	0.667	2.69	5.69	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	36.6	13.8	4.02	0	1.64	3.00	1.61	7.20	0	0	0	0.346
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0.363	3.91	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	2.05	0	0.306	1.97	3.33	1.61	0.379	0	1.95	0	3.46
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0.538	0	1.09	0.279	0.226	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0.336	0.293	0.803	4.59	1.31	2.00	0	0.379	0.726	11.2	1.35	0
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	53.8	49.3	47.1	25.4	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	23.2	11.1	13.0	38.5	0	0	0	0	2.91	4.47	2.26	0
Insecta	Diptera	Chironomidae	Pagastia	0	1.68	0	0	0.612	1.64	2.33	0.807	0	4.72	8.10	27.8	4.16
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0.333	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0.673	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0.07.0	0	0	0	0	0.333	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0.293	0.321	0.612	0.985	2.00	0.538	1.14	0.363	1.67	0	5.54
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0.233	0.321	0.012	0.903	0	0.556	0	0.303	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0.269	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0.293	0	0	0	0	0.209	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0.233	0	0.306	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0.300	0.657	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0.657	0	0	0	0	0	0	0
	· · · · · · · · · · · · · · · · · · ·	+	•		0	0	0	-	0	0	-	0	0	0	0	
Insecta	Diptera	Chironomidae	Thienemanniella	0	U	U	U	0.306	U	U	1.34	U	U	U	U	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three	-minute Kick S	amples					
			I	2012		2	014				)15			2021		2022
Higher Level	Classification	Family	Lowest Practical Level	RG_GHCKU		GRE	E4-25			GRE	E3-75			RG_GHNF		RG_GHNF
			Identification	RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHNF-1		RG_GHNF-3	_
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0.558	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0.879	0.964	2.45	2.30	0.667	2.15	4.93	6.17	6.14	13.3	12.8
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0.693
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0.282	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.313	0	0.567	0.392	0	1.72	2.22	0	1.43	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0.392	0	0	0	0	5.02	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0.637	0	0	0	0	0	0	0	0	0.748	1.41	7.35
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0.367
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0.319	0	0	3.18	0	0	3.30	0	0.565	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0.339	0	0	0	0.643
Insecta	Diptera	Psychodidae	Pericoma	0	0	0	0	0	0	0	0	0	0	0	0	0.010
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	1.57	1.91	1.70	1.10	1.73	3.72	0.317	3.55	2.38	10.2	8.97	2.82	1.29
Insecta	Diptera	Psychodidae	Psychoda Psychoda	0	0	0	0.157	0	0	0.317	0	0	0	0.97	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0.137	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0.188	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simulidae	Prosimulium/Helodon	0	0	0	0.188	0	0	0	0	0	0	0	0	0
			<u> </u>		•	_					•	,		<u> </u>		
Insecta	Diptera	Simuliidae Simuliidae	Simuliidae Simulium	0.313	0 4.46	0 1.13	0 2.45	0	0.860	0.317	0	0 6.45	0	0	0	0
Insecta	Diptera			+										-		
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0.940	0.319	2.27	1.10	0.867	2.58	1.27	0.254	10.9	4.52	3.74	4.44	0.643
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0.338	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	1.88	0.317	1.13	0.939	0	0	0.315	0	1.01	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0.338	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0.254	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0.635	0	0	0.578	1.15	0.946	0	0.676	0	0	0	0.643
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0.315	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	3.45	1.90	0.567	1.88	1.16	0.573	2.21	0.254	0.338	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0.287	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	1.01	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0.627	5.71	17.6	12.2	10.1	1.43	2.84	16.5	19.3	49.5	19.8	12.4	28.6
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0	0	0.341
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0.469	0	0	1.58	0.254	0.338	0.291	0.251	0	4.09
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0.874	0.753	0.639	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	1.53
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	4.85	12.9	0.469	5.06	8.02	4.73	14.2	2.36	7.86	18.9	0	1.53
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	1.39	8.61	0.469	3.03	1.43	0	0	0	0	0.379	16.2	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana  Zapada oregonensis group	0	1.39	0.01	0.409	0	0	0	0	0	0	0.379	0	0
				-		0		_	0	<b>-</b>		0	0	_	0	-
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	U	0.156	0	U	0	0	U	U	0	U	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three-	minute Kick Sa	amples					•
			Lowest Practical Level	2012			)14				15			2021		2022
Higher Level	Classification	Family	Identification	RG_GHCKU			E4-25				E3-75			RG_GHNF		RG_GHNF
				RG_GHCKU-1	GREE3-25-1	GREE3-75-1		GREE4-75-1	RG_GHCKU-1			GREE4-75-1	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-1
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	1.10	0.867	0	0	1.27	0	0	0	6.61	21.5
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.635	2.83	0	0	2.87	1.89	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	4.95	4.27	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	1.59	12.8	2.19	3.47	8.60	12.3	0	1.01	2.33	0.502	8.95	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0.283	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0.573	0.868	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0.313	0	2.55	0	0.578	0	0.434	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0.627	0.317	0	0.939	0	0	1.74	0.254	0	0	1.49	0.403	2.57
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0.313	0	0	1.10	0	0.287	0.434	0	0.338	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0.313	0.317	0	0.156	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon		Three-minute	Kick Samples					Area-	-based Kick Sa	mples				
			Lowest Practical Level	20	022						2016					
Higher Level (	Classification	Family	Identification	_	GHNF			_	GHUT					RG_GHNF		
	I				RG_GHNF-3		RG_GHUT-2	RG_GHUT-3			RG_GHUT-6			RG_GHNF-3		
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	1.10	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	2.62	1.11	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	7.59	13.3	6.90	1.10	6.01	3.20	4.51	4.01	4.70	5.32	3.19
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0.581	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0.291	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.581	0	0.690	0	3.45	0	0.858	0	0	1.34	1.34	1.06	0.498
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	0.671	0	1.49
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0.800	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0.690	0	3.45	0	0	0.800	0.752	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0.671	0	0.419
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0.395	3.49	0	1.72	0	0	3.50	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0.875	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.309	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	9.76	4.77	8.62	3.30	4.45	7.00	2.31	0.490	1.34	14.0	0.801
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0.198	4.88	5.96	10.3	5.49	22.2	15.8	2.31	0.490	0	2.91	0.801
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	27.8	5.73	0	2.38	0	0	0	0	0	0.490	2.01	1.16	3.60
Insecta	Diptera	Chironomidae	Limnophyes	0.619	0	0	0	0	0	0	0	0	0	0.671	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	1.75	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0.309	0.198	1.39	0	0	6.59	0	0	0.770	10.6	0	0	0
Insecta	Diptera	Chironomidae	Monodiamesa	0.309	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0.989	39.7	22.6	8.62	12.1	17.8	18.4	13.1	15.9	33.6	20.9	45.7
Insecta	Diptera	Chironomidae	Pagastia	1.55	7.32	0	1.19	1.72	0	2.67	1.75	0.770	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0.309	0.395	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	1.54	3.19	0	0	0.801
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0.401
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	8.66	3.76	0.697	0	1.72	4.40	0	1.75	0	0	0	0	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	0.00	0	1.39	0	0	0	0	1.75	3.08	9.32	0	1.16	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
	•				0	0	0	0	0	0	0	0	0	0	0	
Insecta	Diptera	Chironomidae	Thienemanniella	0	U	U	U	U	U	U	U	U	U	U	U	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

	Higher Level Classification Family				Kick Samples					Area	-based Kick Sa	mples				
			Lowest Practical Level		022						2016					
Higher Leve	el Classification	Family	Identification		GHNF	DO 011117 4	DO 011117 0	_	GHUT	DO 011117 F	DO 011117 0	DO OUNE 4	DO 011115 0	RG_GHNF	DO OUNE 4	DO OUNE
Incosts	Diptera	Chironomidae	Thionomonnimuia group	0 RG_GHNF-2	RG_GHNF-3	0 RG_GHU1-1	RG_GHUT-2	0 RG_GHU1-3	0 RG_GHU1-4	0 RG_GHU1-5	0 RG_GHU1-6	0 RG_GHNF-1	RG_GHNF-2	0 RG_GHNF-3	RG_GHNF-4	RG_GHNF
Insecta Insecta	Diptera	Chironomidae	Thienemannimyia group  Tvetenia	1.24	61.1	2.79	7.15	3.45	0	1.78	3.50	7.70	3.19	2.68	1.16	4.41
	· '			2.17	0	0		0	0		0	0		0	0	
Insecta	Diptera	Chironomidae	Zavrelimyia	_			0			0	0		0			0
Insecta	Diptera	Dixidae	Dixa	0	0	0		0	0	0		0		0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	1.13	0	0	0	0	4.51	0.445	1.34	5.43	2.80
Insecta	Diptera	Empididae	Clinocera	0	0	0.690	1.13	1.72	0	0	0	0.752	1.34	0	0	4.81
Insecta	Diptera	Empididae	Neoplasta	6.69	0.923	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0.185	0	0	1.72	0	1.15	2.40	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	1.16	0	0	1.13	0	0	0	0	0.752	2.45	0.671	0	2.00
Insecta	Diptera	Psychodidae	Pericoma	0	0	1.38	0	8.62	3.30	0	2.40	0.752	0.891	0.671	0	0
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	7.85	1.85	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0.445	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	2.20	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	2.33	0.185	6.21	11.3	13.8	7.69	10.3	4.00	16.5	19.4	18.1	3.26	6.41
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0.891	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	8.62	3.30	0	2.40	0.752	0.891	0.671	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0.445	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0.440	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	2.20	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0.690	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0.090	11.3	13.8	7.69	10.3	4.00	16.5	19.4	18.1	3.26	6.41
	· · · · · · · · · · · · · · · · · · ·	· · ·			0							0				
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0.891	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae			·						•				-
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	3.45	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	7.85	4.67	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0.581	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	7.59	0	0	0	0	1.60	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	1.60	0	0.445	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0	0	1.38	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0.581	0.373	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	4.44	0	2.20	0	0.800	4.51	3.56	3.36	19.7	2.79
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon		Three-minute	Kick Samples					Area-	based Kick Sa	mples				
			Lowest Practical Level	20	022						2016					
Higher Level	Classification	Family	Identification	RG_	GHNF				GHUT					RG_GHNF		
	TI-		racination .	RG_GHNF-2	RG_GHNF-3	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	9.07	2.66	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	16.6	19.0	33.0	12.0	8.00	19.6	7.35	6.71	8.51	5.58
Insecta	Plecoptera	Perlodidae	Megarcys	2.27	7.98	0	0	1.72	0	0	0	0.752	0	1.34	2.66	0.398
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	3.45	0	0	1.10	0	0	0	0	0	1.06	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	1.11	1.72	7.69	15.4	16.8	4.51	0.891	0.671	0	0.398
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	2.22	1.72	0	0	0	10.5	10.9	17.4	5.32	11.2
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0.175	0	0	0.146	0	0	0	1.34	2.66	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0.690	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	1.11	0	1.10	1.72	0	0	2.00	0	1.06	0.797
Insecta	Trichoptera	Limnephilidae	Limnephilidae	13.9	0	0	1.11	0	3.30	0	0.800	0	0	0	1.60	0.398
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0.317	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	1.38	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	-based Kick Sa	mples					
			Lowest Practical Level				2016						20	17		
Higher Level (	Classification	Family	Identification	RG_GHNF				GHFF					_	GHUT		
	T			RG_GHNF-6	RG_GHFF-1	RG_GHFF-2		RG_GHFF-4			RG_GHUT-1	RG_GHUT-2		RG_GHUT-4	RG_GHUT-5	
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	3.77	0.634	1.30	2.39	5.64	1.80	0.672	4.24	12.3	7.14	2.71	5.96	2.48
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.943	1.27	1.63	0.896	0	0.771	0	0.265	0	0	0	0.221	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0.440	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0.440	0	0.298	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0.317	0	0	0	0	0	0	0	0	0	0.221	0.310
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0.246	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0.265	0	0	0	0.221	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0	0.888	0	0.312	0	0.654
Insecta	Diptera	Chironomidae	Chaetocladius	0	0.665	0	0	0	0	0	0	0.296	0	0.312	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0.296	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	11.4	9.18	8.31	4.09	11.3	11.7
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0.312	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	3.66	6.48	7.68	7.91	3.50	10.1	0	5.77	8.57	7.90	5.41	4.14
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	2.83	0.332	0	0	0	0	0	0.901	1.63	0.779	0.625	1.58	0.654
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	12.3	0	0	0	0	0	0	0	0	0.260	0.312	1.35	1.96
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	20.8	53.2	59.3	52.5	37.5	55.7	49.0	45.6	35.1	42.6	30.6	34.0	44.2
Insecta	Diptera	Chironomidae	Pagastia	0	13.6	12.3	24.0	27.7	14.3	21.0	2.79	2.22	3.63	4.09	5.41	6.43
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0.312	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0.260	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0.332	0	0	0	1.08	0.699	0	3.26	2.08	1.59	4.06	2.29
Insecta	Diptera	Chironomidae	Psilometriocnemus	2.83	0.332	0	0	0	0.538	0.055	0.270	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0.556	0	0.270	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0.332	0	0	0	0	0	0	0	0	0	0	0
			•			0		0			0	0	_	_		
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	U	0	U	0	0	U	U	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	-based Kick Sa	mples					
			Lowest Practical Level				2016						20			
Higher Level	Classification	Family	Identification	RG_GHNF				GHFF					RG_0			
Inconto	Dinton	Chiramamidaa	This paragraphs discuss									RG_GHUT-2				
Insecta	Diptera	Chironomidae	Thienemannimyia group	0 4.72	0 2.33	0	0	3.29	0 5.65	0 3.15	0 2.52	3.55	1.04	0 2.22	2.03	0
Insecta	Diptera	Chironomidae	Tvetenia			1.71	0									0.327
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	1.89	5.07	7.49	2.09	3.44	3.87	1.35	0.265	0.293	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0.943	1.58	0.651	0.299	1.25	1.03	0.677	0.265	0.293	0.246	0	0.662	0.620
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0.265	0.587	0.739	0	0.221	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	1.24
Insecta	Diptera	Pelecorhynchidae	Glutops	0	1.90	0.977	0.299	0	0	0	0	0	0	0.298	0	0
Insecta	Diptera	Psychodidae	Pericoma	2.83	0.634	0	0	0.313	0.516	0	0.618	1.32	0.246	0.894	0.662	0.931
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0.313	0	0	0.618	0	0	0	0	0.310
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0.265	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	8.49	1.90	0.326	0.299	1.57	1.29	0	1.86	6.01	5.67	4.23	1.99	2.79
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0.326	0.261	0	0	0.273	0	0	0.246	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	2.83	0.634	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0.001	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0.299	0	0	0	0	0.587	0	0	0	0
					0	-	0.299	0	·		0		0	0		
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	•	0		ļ -	0	0	0	0	0		0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	-	0	0	0	0	0	0	-	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0		0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0.313	0	0	0	0	0	0	0.221	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	8.49	1.90	0.326	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0.326	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0.883	0.880	0.246	1.82	1.32	1.24
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0.299	1.88	0.514	0.672	23.7	11.9	14.8	33.4	13.2	7.96
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	0	0	0	0	0.293	0	0.596	0.883	0.310
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0.587	0	0.298	0.662	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0.951	0	0	0	0	0	0	0.293	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0.597	1.88	2.83	3.36	2.12	1.32	1.23	1.52	5.30	7.03
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana Zapada oregonensis group	2.83	0	0	0	0	0	0	0	0	0	0	0	0
mocold	Посорієта	Nomoundae	Zapada oregonensis group	2.00	U	U	U	U	U	U	U	U	U	J	U	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sai	nples					-
			Lowest Practical Level		_		2016						20	)17		
Higher Level	Classification	Family	Identification	RG_GHNF				GHFF						GHUT		
	1				RG_GHFF-1	RG_GHFF-2		RG_GHFF-4	RG_GHFF-5		RG_GHUT-1	RG_GHUT-2		RG_GHUT-4	RG_GHUT-5	RG_GHUT-6
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	2.19	3.60	1.34	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	19.8	2.22	0.326	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.317	0	0	0.410	0	0.336	0	0	0	0.596	0.221	0.620
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	4.18	4.07	0.771	4.70	0.265	0	0.739	0.298	0.221	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0.317	0	0	0	0.257	1.01	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	6.60	2.22	1.30	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0.896	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	8.49	0	0.651	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0.317	0.977	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0.299	0.313	1.54	0.336	0	0.293	0.739	0	2.65	1.86
Insecta	Trichoptera	Limnephilidae	Homophylax	0	1.90	0.651	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0.977	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	2.69	0	0.514	1.34	0.618	0	0.246	0.298	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	-based Kick Sa	mples					
			Lowest Practical Level						20	017						2018
Higher Level	Classification	Family	Identification				GHNF				T = 2 = 2 = 2 = 2	RG_0				RG_GHUT
Clitallata	Tubificida	Naididae	Nais		RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6		RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5		RG_GHUT-1
Clitellata Clitellata	Tubilicida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	- Tubilicida	Enchytraeidae	Enchytraeidae	0	2.22	2.32	6.83	2.13	1.39	0.820	0	1.22	0.777	0	0.326	4.64
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0.83	0	0	0.820	0	0	0.777	0	0.320	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	_	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	1.24	0	0.279	0	0.257	0.610	0.777	0	0.651	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0.279	0	0.257	0.010	0.777	0	0.001	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0.279	0	0.207	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0.27 0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0.621	0.304	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0.021	0.004	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0.273	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0.978	0	0.287	0	0.333	0	0.426	0	0	0	0	1.05	1.88
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	1.88
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	7.82	1.94	2.15	18.4	2.33	4.26	1.70	0.794	2.62	1.92	0	1.05	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	3.91	0.970	0.287	1.67	4.33	0.984	0.426	1.32	0	2.46	2.74	0.699	10.7
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	28.1	1.72	1.67	1.000	0.984	0	0	0	0	0	0	6.28
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	0	0	0	0	0.426	3.70	0.655	3.28	0	2.44	0.628
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	1.96	8.73	7.45	0	3.33	5.91	45.1	27.8	34.7	37.8	52.9	36.3	12.6
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	28.5	28.3	32.1	26.6	24.6	20.3	1.26
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	1.72	0	0	0	0	0.529	0	0.274	4.56	0	5.65
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0.287	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0.287	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	-based Kick Sa	mples					
			Lowest Practical Level						20	017						2018
Higher Lev	el Classification	Family	Identification		T = = = = = = = =		GHNF	T = -			T = = = = = = =	RG_0				RG_GHUT
	5: :						RG_GHNF-4									
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	18.6	0.970	0	0	6.00	2.62	0	0.794	0	0.274	0.912	1.05	2.51
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	4.44	0	3.11	0.304	0	2.46	3.60	3.66	4.40	5.36	3.26	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0.279	0	0.257	0	0	0.893	0	0.515
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera		0		0	0	0	0	-	0		0	0	0
Insecta	Diptera	Empididae	Wiedemannia Muscidae	0.923	0	0	0	0	0	0.820	0.514	0	0.518	0	0	0
Insecta	Diptera	Muscidae		0	_	0.273		0.304	0	0	1.80		0.259	0	0.651	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	1.48 1.48	2.05	1.24	1.22	0.557	0	0.257	0		0	-	0
Insecta	Diptera	Psychodidae	Pericoma Pericoma/Telmatoscopus	0	0		0.621	0	+	0	0.257	0	0.259	0	0	0
Insecta	Diptera	Psychodidae		0		0			0			0			Ū	0
Insecta	Diptera Diptera	Psychodidae Sciomyzidae	Psychoda Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	· ·	Sciomyzidae	•	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera	Simulidae	Gymnopais Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simulidae	Simuliidae	0.923	0	0	0	0.912	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulidae	0.923	0	0	0	0.912	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	1.85	1.48	13.2	2.48	3.04	0	1.23	2.31	1.83	1.04	0	2.28	17.0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0.273	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0.771	0	0.259	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0.901	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0.257	0	0.259	0	0.326	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0.741	0	1.24	0	0.279	1.64	1.29	1.22	0.518	0.893	2.61	0.515
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	10.8	3.70	15.3	3.11	9.42	10.6	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0	0	1.55
Insecta	Plecoptera	Capniidae	Paracapnia	37.8	37.0	49.8	53.4	60.5	64.6	2.87	11.3	4.27	2.59	0	4.23	29.4
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	2.48	0	0.279	0	0.771	0	0.259	0	0	1.03
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0.771	0.610	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0.304	0	0	0.257	0	0	0.893	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0	0	0	0.621	2.43	3.06	1.64	6.94	7.93	4.66	0.893	4.89	1.03
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
			Lowest Practical Level						20	17						2018
Higher Level	Classification	Family	Identification				GHNF						GHFF			RG_GHUT
	B	D. #		_	RG_GHNF-2		_	_	_	_	_	_	RG_GHFF-4			
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	9.01	5.93	1.64	0.621	1.22	1.67	0	0	0.610	0.518	0	0	0.515
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.741	0	0	0	0.279	2.46	1.29	2.44	2.59	0	2.28	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	4.50	0	0	0	0.608	1.39	7.38	1.80	0.610	4.66	3.57	13.0	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0.257	0	0	0	0.651	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0.682	0	0	0	0.410	0	1.22	0.518	0.893	0.326	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0.621	0	0	1.64	1.80	3.66	2.59	0.893	1.63	0.515
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

Higher Level Classification   Family   Lowest Practical Level   Identification   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GHUT   R.G. GH	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	RG_GHFF-1 0 0 0 0 0.239	0	5 RG		GHNF		2018										
Name   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part	6 RG_GHFF-1 RG_GHF	RG_GHFF-1 0 0 0 0 0.239	0	5 RG		GHNF			1						Lowest Practical Level		<u>.</u>	
Citellates   Tubrifode	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0.239	0	5 KG				DO CUNE O	DO OUNE 4	DO OUUT O	DO OUUT 5		DO OLIUTA	DO CHUT O		Family	Classification	Higher Level
Citellata   Turbificida   Nasidae   Nasidae   Nasidae   Turbificida   Nasidae   Turbificida   Nasidae   Turbificidae   O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0.239	-												Nais	Naididae	Tuhificida	Clitellata
Citelata   Tublifolda   Nalididae   Tublifoldae   0   0   0   0   0   0   0   0   0	0 0 0.239 0 0 0 0 0 0 0 0 0 0 0	0 0.239	Ü		-	-	•					•	•					
Citellate	0.239 0 0 0 0 0 0 0 0 0 0 0	0.239	0		_	-	· ·			-		-						
Citelata   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colembola   Colem	0 0 0 0 0 0 0 0 0 0		-		_	0				-		-						
Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Collembola   Col	0 0 0 0 0 0 0 0		-				+								•		-	
Euchelicorata   Sarcopilformes	0 0	0	0.870	(	1.22	16.7	0	0.529	1.23	0	0	0	2.44	0		•	Collembola	
Euchelicerata   Trombidiformes   Hygrobatidae   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Labertifia   Laberti	0 0	0	0			0	0		+	0	0	0	0	0	Oribatida	-	Sarcoptiformes	Euchelicerata
Euchelicerata   Trombidiformes   Lebertidae   Lebertidae   Sperchon   0   0   0   0   0   0   0   0   0		0	0		0	0	0	0	0	0	0	0	0	0	Wandesia	Hydryphantidae	Trombidiformes	Euchelicerata
Euchelicerata   Trombidiformes   Sperchont   Sperchon   O   O   O   O   O   O   O   O   O		0	0		0	0	0	0	0	0	0	0	0	0	Hygrobates	Hygrobatidae	Trombidiformes	Euchelicerata
Euchelicerata   Trombidifforms   Torrenticolidae   Torrenticolidae   O   O   O   O   O   O   O   O   O	0 0	0	0		1.22	0	0	0	0	0	0	0	0	0	Lebertia	Lebertiidae	Trombidiformes	Euchelicerata
Insecta   Coleoptera   Curculionidae   Curculionidae   O   O   O   O   O   O   O   O   O	0.239 0	0.239	0		0	0	0	0	0	0	0	0	0	0	Sperchon	Sperchontidae	Trombidiformes	Euchelicerata
Insecta   Coleoptera   Dytiscidae   Dytiscidae   O   O   O   O   O   O   O   O   O	0 0	0	0		0	0	0	0	0	0	0	0	0	0	Torrenticolidae	Torrenticolidae	Trombidiformes	Euchelicerata
Insecta   Coleoptera   Dytsolde   Sticotarsus   0   0   0   0   0   0   0   0   0	0 0	0	0		0	0	0	0	0	0	0	0	0	0	Curculionidae	Curculionidae	Coleoptera	Insecta
Insecta   Coleoptera   Elmidae   Heterlimnius   0   0   0   0   0.375   0   0   0   0   0   0   0   0   0	0 0	0	0		0	0	0	0	0	0	0	0	0	0	Dytiscidae	Dytiscidae	Coleoptera	Insecta
Insecta   Coleoptera   Elmidae   Narpus   0   0   0   0   0   0   0   0   0	0 0	0	0		0	0	0	0	0	0	0	0	0	0	Stictotarsus	Dytiscidae	Coleoptera	Insecta
Insecta   Coleoptera   Elmidae   Optioservus   O   O   O   O   O   O   O   O   O	0 0	0	0		0	0	0	0	0	0	0.375	0	0	0	Heterlimnius	Elmidae	Coleoptera	Insecta
Insecta   Coleoptera   Staphylinidae   Staphylinidae   O   O   O   O   O   O   O   O   O	0 0	0	0		0	0	0	0	0	0.649	0	0	0	0	Narpus	Elmidae	Coleoptera	Insecta
Insecta   Diptera   Ceratopogonidae   Ceratopogonidae   Culicioides   O   O   O   O   O   O   O   O   O	0 0	0	0		0	0	0	0	0	0	0	0	0	0	Optioservus	Elmidae	Coleoptera	Insecta
Insecta   Diptera   Ceratopogonidae   Culicoides   O   O   O   O   O   O   O   O   O	0 0	0	0.870	(	0	0	0	0	0	0	0	0	0	0	Staphylinidae	Staphylinidae	Coleoptera	Insecta
Insecta   Diptera   Ceratopogonidae   Probezzia   Diptera   Diptera   Chironomidae   Apedilum   Diptera   Diptera   Chironomidae   Apedilum   Diptera   Diptera   Chironomidae   Boreoheptagyia   Diptera   Diptera   Chironomidae   Boreoheptagyia   Diptera   Diptera   Chironomidae   Brilla   Diptera   Diptera   Chironomidae   Brilla   Diptera   Diptera   Chironomidae   Brilla   Diptera   Diptera   Chironomidae   Chaetocladius   Diptera   Diptera   Chironomidae   Chaetocladius   Diptera   Diptera   Chironomidae   Chironomiae   Diptera   Diptera   Diptera   Chironomidae   Chironomiae   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Dipter	0 0	0	0		_	0	0	-	0	0	_	0	0		Ceratopogonidae	Ceratopogonidae	•	Insecta
Insecta   Diptera   Chironomidae   Apedilum   O   O   O   O   O   O   O   O   O	0 0	0	0		0	0	0		0	0	0	0	0		Culicoides	Ceratopogonidae	Diptera	Insecta
Insecta   Diptera   Chironomidae   Boreoheptagyia   O   O   O   O   O   O   O   O   O	0 0		-				<u> </u>						<u>_</u>				•	Insecta
Insecta   Diptera   Chironomidae   Brillia   Diptera   Chironomidae   Chaetocladius   Diptera   Chironomidae   Chaetocladius   Diptera   Chironomidae   Chaetocladius   Diptera   Chironomidae   Chironomidae   Chironomidae   Chironomidae   Chironomidae   Chironomidae   Chironomidae   Chironomidae   Diptera   Diptera   Chironomidae   Corynoneura   Diptera   Diptera   Chironomidae   Diamesa   Diptera   Diptera   Chironomidae   Diamesa   Diamesa   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera	0 0		-		_	-	<u> </u>					-		_	<u>'</u>			
Insecta   Diptera   Chironomidae   Chaetocladius   D   D   D   D   D   D   D   D   D	0 0		-		_		_	-	_	-	_	-			,		·	
Insecta   Diptera   Chironomidae   Chironomus   0   0   0   0   0   0   0   0   0	0 0																•	
Insecta   Diptera   Chironomidae   Corynoneura   O   O   O   O   O   O   O   O   O	0 0					-	-						-					
Insecta   Diptera   Chironomidae   Diamesa   1.41   0   0   0   15.6   0.638   0   0   0   0   0   0	0 0		-		-	-	· ·	-		-		-					•	
Insecta         Diptera         Chironomidae         Diplocladius         0         0         1.08         0         0.779         0         0         0         0         0           Insecta         Diptera         Chironomidae         Eukiefferiella         29.6         10.0         8.64         33.3         35.8         8.93         3.90         4.49         0         5.39         4.41           Insecta         Diptera         Chironomidae         Heleniella         0         0         0         0         0         0         0         0           Insecta         Diptera         Chironomidae         Hydrobaenus         1.41         17.0         0         0.951         0         0         4.46         0         1.04         0         0           Insecta         Diptera         Chironomidae         Limnophyes         0         0         0         0         0         0         0         0         0         0           Insecta         Diptera         Chironomidae         Limnophyes         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0		-		_	-			_			-					•	
Insecta         Diptera         Chironomidae         Eukiefferiella         29.6         10.0         8.64         33.3         35.8         8.93         3.90         4.49         0         5.39         4.41           Insecta         Diptera         Chironomidae         Heleniella         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0		-		_		<u> </u>					-	<u>_</u>				·	
Insecta         Diptera         Chironomidae         Heleniella         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0		-		_				_		_						·	
Insecta         Diptera         Chironomidae         Hydrobaenus         1.41         17.0         0         0.951         0         0         4.46         0         1.04         0         0           Insecta         Diptera         Chironomidae         Limnophyes         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td>2.27 3.08</td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td></td>	2.27 3.08					-			-								•	
Insecta         Diptera         Chironomidae         Limnophyes         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0		-		_	-				-		-					·	
Insecta Diptera Chironomidae Metriocnemus 0 0 0 0 0 0 0 0 0 0 0	0 0				_										•		•	
	0 0				_		_	-		-	_	_			· · ·		•	
	0 0					-	•	-		-		-						
Insecta         Diptera         Chironomidae         Micropsectra         0         0         0.951         0.779         0         0.558         0         0         0         0           Insecta         Diptera         Chironomidae         Monodiamesa         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0.505 0				Ţ		<u> </u>	-		-							·	
mosta Special constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the constrained to the	0 0		-		•	-											•	
Insecta         Diptera         Chironomidae         Orthocladius         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0 28.5 29.1		_									-					·	
	28.5 29.1								+						<u> </u>		•	
Insecta         Diptera         Chironomidae         Pagastia         1.41         1.00         4.32         0         1.56         1.28         0.558         0         0         0         0           Insecta         Diptera         Chironomidae         Parametriocnemus         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <t< td=""><td>0 0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>•</td><td></td><td>·</td><td></td></t<>	0 0														•		·	
Insecta Diptera Chironomidae Parametriochemus 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0		_			-							-				•	
Insecta Diptera Chironomidae Paraphaeriociadius 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0		_		_		_				_	_	-		·		•	
Insecta Diptera Chironomidae Paroritiociadius 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0						_										·	
Insecta Diptera Chironomidae Polypedilum 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0																•	
Insecta Diptera Chironomidae Pseudodiamesa 0 7.01 0 6.18 7.01 0 1.12 0 1.04 0 0	0 0					-				-	_	-					-	
Insecta Diptera Chironomidae Psilometriocnemus 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0					+						-					·	
Insecta Diptera Chironomidae Rheocricotopus 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0				_												·	
Insecta Diptera Chironomidae Rheotanytarsus 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0				_							-			<u> </u>		•	
Insecta Diptera Chironomidae Stempellina 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0				_	-						-			•		·	
Insecta Diptera Chironomidae Stempellinella 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0				_	-					_	_			•		•	
Insecta         Diptera         Chironomidae         Tanytarsus         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	0 0					-						-			•			
Insecta Diptera Chironomidae Thienemanniella 0 0 0 0 0 0 0 0 0 0 0 0		0				-	_										•	

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	-based Kick Sa 2018	mples					
Higher I eve	l Classification	Family	Lowest Practical Level			RG_GHUT			1	2018	RG.	GHNF			B.G.	GHFF
riigher Leve	Glassification	1 uniny	Identification	RG GHUT-2	RG GHUT-3		RG GHUT-5	RG GHUT-6	RG GHNF-1	RG GHNF-2		RG_GHNF-4	RG GHNF-5	RG GHNF-6	_	
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	5.64	9.02	14.0	13.8	1.56	45.9	34.0	11.2	38.5	24.3	24.7	0.253	1.76
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	0	0	0	0	0	0	0	0	2.39	1.68
Insecta	Diptera	Empididae	Clinocera	0	0.813	1.61	0	0	0	0	0	0	0	0	2.63	0.420
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0.749	0	0	0	1.12	0	0	3.53	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0	1.22	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	1.23	5.69	0.806	2.25	0	3.07	1.06	7.87	0.980	3.66	7.93	0	0
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0.00	0.000	0	0	0.07	0	0	0.300	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
	· ·	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera				-						_		_	-		
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	8.64	5.69	12.9	5.24	3.25	6.75	4.23	18.0	6.86	4.88	5.29	2.63	0.420
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	1.12	0.980	0	0	0.239	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0.955	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0.716	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0.649	0.613	2.65	2.25	1.96	1.22	2.61	0	0
Insecta	Plecoptera	Caprilidae	Paracapnia	9.88	23.6	12.9	14.2	6.49	15.9	25.9	25.8	18.6	14.6	19.1	8.35	2.94
	-	Caprilidae	Chloroperlidae	9.88	0	0	0	0.49	0	25.9	25.8	0	0	0	0.35	0.420
Insecta	Plecoptera		'					-								
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0.239	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	2.47	0.813	0	2.25	5.84	3.07	0.529	3.37	0.980	8.54	4.35	22.4	26.5
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
			Lowest Practical Level							2018						
Higher Level	Classification	Family	Identification			RG_GHUT						GHNF			RG_0	GHFF
	1		Taonimoution	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	2.44	0.806	0.375	0	2.45	2.12	7.87	1.96	6.10	2.61	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0.375	0	0	0	0	0	0	0	1.19	1.68
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0.649	0	0	0	0	0	0	0.239	0.420
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0.649	2.45	0.529	2.25	0	3.66	6.09	5.01	7.98
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0.420
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0.813	0	0.749	0	0.613	0.529	0	0	0	0	0	0.420
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0.477	1.68
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	-based Kick Sa	mples					
			Lowest Practical Level			)18						2019				
Higher Level	Classification	Family	Identification		RG_	GHFF				RG_	GHUT				RG_GHNF	
					RG_GHFF-4	RG_GHFF-5	_	RG_GHUT-1	_	_	RG_GHUT-4	RG_GHUT-5		RG_GHNF-1	_	
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0.480	0.576	4.55	7.46	1.40	4.33	8.13	11.3	0.216	0.541	0
Clitellata	=	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0.855	0	0	0	0	1.86	0	0	0	0	1.08	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0.423	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.211	0	0	0.288	0	0	0.465	0.433	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0.211	0	0	0	0	0	0	0.433	0	0.173	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0.576	0	0	0	0	0.478	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0.211	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0.577	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0.977	0	0	0	0	1.21	0.233
Insecta	Diptera	Chironomidae	Chaetocladius	0	1.36	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0.228	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0.721	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	4.59	1.36	3.53	1.96	20.8	18.5	9.29	18.1	24.2	52.3	1.14	4.24	3.72
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	5.77	15.4	30.8	2.26	1.98	0.721	1.14	0.605	3.72
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0.219	0	0	0	0	0	0.977	0	0.494	0	0	0	0.233
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	34.1	33.6	34.5	27.4	27.7	19.6	10.8	34.4	36.6	8.83	1.83	7.26	1.86
Insecta	Diptera	Chironomidae	Pagastia	11.4	30.7	26.7	25.8	8.08	7.20	3.91	11.3	8.40	11.7	5.94	1.21	2.09
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	1.15	4.12	7.33	0.453	1.48	0.721	0.228	0	1.40
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0.400	0	0.721	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
	· .	Chironomidae	·	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera		Tanytarsus			_					-	-				
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	-based Kick Sa	mples					
			Lowest Practical Level			018						2019		1		
Higher Leve	el Classification	Family	Identification			GHFF					GHUT				RG_GHNF	T =
										_		RG_GHUT-5				
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0.437	1.59	4.03	1.96	9.23	10.3	3.42	4.08	2.47	2.25	77.4	40.0	67.0
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0.605	0.233
Insecta	Diptera	Dixidae	Dixa	0	0	0.240	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.634	0.855	0.959	6.34	0	0.498	0	0	0	0	0.431	0	0
Insecta	Diptera	Empididae	Clinocera	1.27	1.07	0.240	0.865	0	0	1.40	0	0	0	0.216	0.545	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0.347	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0.423	0.214	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	0	0.641	0	0.576	1.14	2.49	5.58	1.73	0.957	0.693	3.23	4.36	1.12
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0.545	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	1.06	1.07	0.719	4.03	5.68	3.48	6.51	5.20	3.83	1.91	1.08	0	0.44
Insecta	Diptera	Tipulidae	Limnophila	0	0	0.719	0	0	0	0.51	0	0	0	0	0	0.44
	Diptera	Tipulidae	Molophilus	0	0	0.240	0	0	0	0	0	0	0	0	0	0
Insecta	· ·	'	Pedicia		0	0	0	0	0		0	0	0	0	0	
Insecta	Diptera	Tipulidae		0			-	-	-	0	_	-	-	_		0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0.211	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0.480	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0.959	0.576	0	0	0	0.433	0.478	0	0	0.541	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0.846	0.641	0.719	0.576	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0.211	0	0	0	1.14	0.995	0.465	0	1.91	0.173	1.08	6.49	1.79
Insecta	Plecoptera	Capniidae	Paracapnia	2.96	1.50	3.36	2.88	10.8	6.47	7.91	7.80	3.83	2.95	3.45	6.49	6.94
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0.211	0	1.20	0.865	0	0	0	0	0	0	0	0.541	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0.288	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0.200	0	0	0	0.433	0	1.21	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0.433	0	0	0	0	0
			Zapada	30.2	19.9	13.4	13.3	1.14	0.995	2.33	5.20	2.87	2.95	1.08	15.7	7.1
Insecta	Plecoptera	Nemouridae	•	_			+	-	+							
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
			Lowest Practical Level		20	)18						2019				
Higher Level	Classification	Family	Identification			GHFF					GHUT				RG_GHNF	
				RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	1.08	2.70	0.671
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	1.27	0.855	1.92	4.90	0.568	0	0	0.108	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0.211	0.427	0.480	0.865	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	7.19	3.21	3.12	4.32	1.70	1.99	0	0.433	0.478	0.347	0.216	2.70	0.447
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0.719	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0.211	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0.211	0	0	0	0	0	2.33	0	0	0.693	0	2.70	0.895
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0.498	2.33	2.60	0.957	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	1.06	0.214	1.92	1.15	0	0	0	0.217	0.478	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon						2042	Area-	based Kick Sa	mples			•	120	
Himban Laval	Classification	Family	Lowest Practical Level		DO OUNE			2019	<b>DO</b> .	OUEE					)20	
Higher Level	Classification	Family	Identification	DC CUNE 4	RG_GHNF	DC CUNE C	DC CUEF 4	DC CUEF A		GHFF	DC CUEE F	DC CUEE C	DC CILITA		GHUT	DC CUUT 4
Clitellata	Tubificida	Naididae	Nais	0 RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	0 RG_GHFF-1	0	RG_GHFF-3	0 RG_GHFF-4	<b>RG_GHFF-5</b>	0	0	0	0	0 RG_GHU1-4
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0.391	0.862	0	1.54	0	0.435	0	1.96	0.629	7.22	12.1	2.89	4.36
Clitellata		Enchytraeidae	Enchytraeus	0.331	0.002	0	0	0	0.433	0	0	0.023	0	0	0	0
Collembola	Collembola	Liferiyiracidae	Collembola	0.781	15.5	3.21	0.171	0	0.435	0.505	0	0.210	0	1.66	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0.761	0	0	0.171	0	0.433	0.303	0	0.210	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0.862	0.292	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0.002	0.292	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0.435	0.505	0.130	0	0.555	0	0.578	0
	Trombidiformes		Sperchon	0	0	0	0.684	0	0.435	0.505	0.130	0	0.555	0	0.576	0
Euchelicerata  Euchelicerata	Trombidiformes	Sperchontidae	Torrenticolidae	0	0	0	0.004	0	0.435	0	0	0	0	0	0	0
		Torrenticolidae Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera					-			-			-				
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0.555	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	1.70	6.42	0.313	0	0	0	0	0	0	0	4.46	0.593	0.449
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0.637	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0.526	0	0	0	1.17	3.82	2.96	0.898
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	1.35
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0.851	6.42	2.19	19.8	29.5	21.6	40.8	18.0	25.4	16.4	2.55	8.30	9.43
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	1.28	2.14	1.25	0.971	0	33.2	0	1.09	1.95	2.35	21.7	10.7	10.3
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0.313	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	0	0.583	0	2.11	0	0.313	0.733	2.35	3.19	2.96	11.2
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	1.28	1.07	0.625	4.66	1.90	5.26	11.6	2.35	1.95	31.7	17.8	5.93	1.80
Insecta	Diptera	Chironomidae	Pagastia	0	0	1.56	29.7	18.1	7.37	17.1	34.6	37.9	14.7	0.637	1.78	3.14
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0.637	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0.851	0	0.625	0.388	0	5.26	0	0	0.244	0.587	2.55	5.34	4.04
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples		I			
			Lowest Practical Level				1	2019							020	
Higher Leve	l Classification	Family	Identification	DO 011115 4	RG_GHNF	DO 011115 0	DO 01155 4	DO 01155 0		GHFF	DO 01155 5	DO 01155 0	DO 011117 4		GHUT	
Incosts	Diptera	Chironomidae	Thionomonnimulo group	0 RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	0 RG_GHFF-1	<b>RG_GHFF-2</b>	0 RG_GHFF-3	<b>RG_GHFF-4</b>	0 RG_GHFF-5	0 RG_GHFF-6	0 RG_GHU1-1	0 RG_GHU1-2	RG_GHUT-3	RG_GHU 0
Insecta	Diptera		Thienemannimyia group  Tvetenia	17.9	15.0	61.9	8.55	2.85	2.11	1.22	4.07	4.15	2.35	3.82	7.11	8.53
Insecta	' ·	Chironomidae			0	01.9		0			0	0		0	0	
Insecta	Diptera	Chironomidae	Zavrelimyia	0		-	0		0	0		-	0	-		0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.391	0	0.292	1.88	3.08	0	1.01	1.56	1.68	0.833	1.10	0	0
Insecta	Diptera	Empididae	Clinocera	1.17	0	0	0	1.54	0.435	2.53	1.30	0.210	0.833	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0.555	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0	0	0	0	0	0.578	0
Insecta	Diptera	Psychodidae	Pericoma	4.69	5.17	5.25	1.03	0	0.435	1.01	0.261	1.26	1.11	8.28	12.1	9.12
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	2.73	4.31	0.875	0	0	0	0	0	0.419	0.555	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0.391	0	1.75	3.42	0	1.74	0	2.87	1.05	8.33	6.76	13.3	5.21
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0.130	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0.100	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0.391	0	0	0	0	0	0	0	0	0.555	0	0	0
					0	ļ	0	0	0		0		0.555	0	<u> </u>	
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0		0		0	_	0	Ţ.	0		0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	-	0		0	0	0	0	0	-		0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0.342	0	0	0	0.261	0	0.555	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0.391	0	0	0	0.769	0	1.01	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	10.6	8.62	3.50	0	0	0	0	0	0	0	3.31	0	1.45
Insecta	Plecoptera	Capniidae	Paracapnia	26.9	14.7	7.58	1.71	0.769	4.35	1.52	4.17	0.629	4.44	2.21	9.82	11.6
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0.171	0	0	0.505	0.130	0	0	0.552	0	0.397
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0.769	0	0	0	0	0	0	0.578	0
Insecta	Plecoptera	Nemouridae	Malenka	0	1.72	0	0	0	0	0	0	0.419	0	0	4.04	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	19.5	7.76	6.71	22.8	33.1	11.3	15.7	25.6	19.5	1.67	1.10	0	5.16
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cilindipes  Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
			Lowest Practical Level					2019						20	)20	
Higher Level	Classification	Family	Identification		RG_GHNF				RG_0					_	GHUT	
			raditindation	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	2.73	2.59	1.17	0.171	0.769	0	0	0.782	0.210	0	0.552	1.73	1.19
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.862	0	0.0428	1.54	0	1.52	0.130	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	3.91	3.45	0.583	0.513	3.85	0.435	1.52	0.261	0.839	0	0	0	0
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0.171	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0.435	0	0	0	0.0694	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0.552	8.70	10.3
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	1.17	2.59	0	0.171	0	1.74	0.505	0	0.419	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0.556	1.54	0	1.52	0.130	0.210	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0.555	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa 2020	mples					
Higher Level	l Classification	Family	Lowest Practical Level	RG_0	GHUT			RG	GHNF	2020				RG_GHFF		
g0			Identification			RG GHNF-1	RG_GHNF-2			RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2		RG GHFF-4	RG GHFF-5
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	2.09	6.42	1.14	3.14	3.36	0	4.26	2.47	1.92	0	0.239	1.59	0.329
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0.840	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	1.14	0	1.23	0.319	0.852	0.239	0	0.658
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	0.239	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0.232	0.402	0	0	0	0	0	0	0.319	0	0	0	0.329
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0.719	0	0.319	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0.530	0	0	0.653	0	0	0.767	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0.767	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.795	0.425	1.35	3.27	0	0	6.91	5.93	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0.425	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	9.28	21.3	1.35	0.653	2.16	1.27	0	2.96	2.96	2.46	5.10	0.687	4.79
Insecta	Diptera	Chironomidae	Heleniella	0	0	3.38	0.653	3.24	0	3.07	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	13.5	4.68	4.73	12.4	0	1.27	6.14	0	3.94	2.46	0	11.0	0.685
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	15.1	3.40	0.675	0	0	0	0.767	0	4.27	0.614	0.510	0	0.685
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0.073	0	0	0	0.707	0	0	0.014	0.510	0	0.003
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	11.4	14.9	0.675	0	1.08	0	0	0	8.87	6.14	23.5	21.0	41.4
Insecta	Diptera	Chironomidae	Pagastia	3.71	12.3	1.35	0	0	0	0	0	24.0	13.2	42.4	19.6	27.7
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	1.08	0	0	0	0	0	0	0.344	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0.344	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	2.39	1.28	2.03	7.18	0	0	2.30	0	0.986	0.307	0	0	0.685
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0.960	0.307	0	0	0.003
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	Chironomidae	•	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	·	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera		Stempellina Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	· · · · · · · · · · · · · · · · · · ·	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	· '	Chironomidae	Tanytarsus		_	_					_	-		_		
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
Higher Level (	Classification	Family	Lowest Practical Level	B0 (	NIIIIT	T		<b>DO</b>	OUNE	2020		1		DO OUEE		
Higher Level (	Classification	Family	Identification	RG_C RG_GHUT-5		PG GHNE-1	DC CHNE-2		GHNF RG_GHNF-4	PG CHNE 5	PG GHNE 6	DC CHEE-1	DC CHEE 2	RG_GHFF	PG GHEE A	DC CHEE
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0 0	0	0	0	0 0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	2.65	5.95	14.2	7.84	0	16.6	1.53	5.93	1.31	1.23	1.28	1.37	0
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	1.31	0	0	0.767	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0.719	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	1.71	2.52	8.40	4.78	1.44	1.23	7.03	5.59	7.40	7.62	4.52
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0.840	2.39	0	0	0.319	0.373	0.493	0	0.411
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	1.14	2.52	0.840	0	2.88	0	1.92	0	0	0.635	0.329
Insecta	Diptera	Psychodidae	Pericoma	8.12	8.03	2.86	3.77	8.40	8.36	2.88	1.23	4.15	0	0	3.81	1.32
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	7.66	5.22	21.7	13.2	21.9	11.9	18.0	23.5	1.92	1.70	0.478	4.76	1.97
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0.571	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0.232	0	0	0	0	0	0	0	1.60	2.27	0.957	2.22	1.97
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0.319	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	7.72	0	0	0	0	0	0 207	0
Insecta	Plecoptera	Capniidae	Mesocapnia	7 90	1.54	16.5	8.28	12.7	7.73	2.42	11.5	0 4.15	2.60 6.49	0 230	0.397	0
Insecta	Plecoptera	Capniidae	Paracapnia	7.89 0	7.70 0	13.8	23.2	21.8 1.68	11.6 0	38.7	23.1	4.15 0.319	0.49	0.239	2.78	0.987
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae			-	0		-	0	_			0		0.329
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0 1.26	0.840	0	0	0	0	0.284	0	0	0
Insecta	Plecoptera Plecoptera	Leuctridae	Leuctridae Malenka	0	0	3.14	0	0.840	0 10.2	0	0	0.733	3.52	0	0	0.329 0.680
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0.733	0	0	0	0.680
Insecta	Plecoptera	Nemouridae	Visoka Zapada	2.09	2.41	3.14	2.52	3.36	10.2	0	16.1	24.2	43.4	13.6	19.1	9.52
Insecta	Plecoptera	Nemouridae	Zapada Zapada Zapada Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	9.52
Insecta		Nemouridae	Zapada cinctipes Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	·			0		0	0		0	0			_	
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	-	0	_		0	-	-	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sa	mples					
			Lowest Practical Level			·				2020						
Higher Level	Classification	Family	Identification	_	GHUT				GHNF					RG_GHFF		
					RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4		RG_GHNF-6	RG_GHFF-1			RG_GHFF-4	RG_GHFF-5
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0.239	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	3.43	3.14	5.88	10.2	2.13	3.70	0.319	0.426	0	0.476	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0	0.639	1.28	0.718	0.476	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	1.14	0	1.23	0	0.284	0	1.27	0.329
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0.571	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0.402	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0.317	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	1.70	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	12.3	3.21	0.571	2.52	1.68	1.14	2.84	0	2.56	0	1.91	0.317	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0.284	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0.0125	0	0	0	0	0	0	0.639	2.56	0.478	0.317	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

								Area	-based Kick Sa	mples						
			Lowest Practical Level							2021	1					
Higher Level	Classification	Family	Identification	RG_GHFF	DC CILITA	DC CUUT 2		GHUT	DC CUUT 6	DC CILIT C	DC CUNE 4	DC CUNE 2		GHNF	DC CUNE 5	DC CUNE C
Clitellata	Tubificida	Naididae	Nais	0 RG_GHFF-6	RG_GHU1-1	0	0 RG_GHU1-3	0	0	0	RG_GHNF-1	RG_GHNF-2	()	RG_GHNF-4	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	1.03	3.61	2.73	3.57	1.67	0.439	2.31	1.08	0.702	0	0	1.79	0.336
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	2.13	0.446	0.168
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.412	0.201	0	0.794	0	0	0.384	0	0	0	1.06	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0.333	0	0.384	0.217	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0.397	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0.619	0.201	2.48	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0.967	0	0.480	0	0	1.28	0	0.380	1.33	1.26	0	0.185
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	1.30
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0.483	0	0.960	0.745	0	0	0.237	0.761	0.332	1.26	0.984	1.30
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0.237	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0.332	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	1.72	52.9	51.2	38.4	57.4	63.2	49.8	0.711	0	0	1.26	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0.474	1.52	0.332	0	0	0.555
Insecta	Diptera	Chironomidae	Hydrobaenus	1.72	0	0	0.480	0	0	0	0	1.90	0	0	0	0.925
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	1.26	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0.430	0.483	0	0	0	0	0	0.237	1.52	0.332	0	0	2.59
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	4.94	2.90	10.5	9.60	10.4	3.57	2.98	2.85	0.380	0.995	1.26	1.48	1.48
Insecta	Diptera	Chironomidae	Pagastia	35.6	9.42	14.8	9.60	12.3	6.12	5.95	18.7	3.80	9.95	2.53	25.1	5.00
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0 510	0	0 474	0	0	0	0 0 400	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0.430	0	1.46	5.76	1.12	0.510	0	0.474	2.28	1.33	0	0.492	0.555
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera		Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	•	Chironomidae	Stempellinella		0	-	0				0	0	0			
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0		0	0	0	0	0		0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	U	U	0	U	0	0	U	U	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

								Area	-based Kick Sa	mples						
			Lowest Practical Level							2021	T					
Higher Level	l Classification	Family	Identification	RG_GHFF	DO 011117 4	DO 011117 0	RG_0		DO 011117 5	DO 011117 0	DO 011115 4	DO 011115 0		GHNF	DO 011115 5	
Insecta	Diptera	Chironomidae	Thienemannimyia group	0 RG_GHFF-6	()	0 RG_GHU1-2	RG_GHUT-3	0 RG_GHU1-4	0 RG_GHU1-5	0 RG_GHU1-6	RG_GHNF-1	0 RG_GHNF-2	0 RG_GHNF-3	0 RG_GHNF-4	0 0	0 RG_GHNF-6
Insecta	Diptera	Chironomidae	Tvetenia	1.50	2.90	0.874	0.960	0.745	2.04	0	34.4	37.3	50.1	31.6	15.2	43.7
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0.074	0.300	0.748	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	3.92	0	1.24	0	0	0	0	3.25	1.05	0.464	1.06	4.91	0.671
Insecta	Diptera	Empididae	Clinocera	0	0.602	0	0.794	0.667	0	1.54	0.651	0	0.464	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	1.00	0	0	0.333	0	0.384	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0	0	0.0481	0	0.351	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	0.619	2.61	3.97	5.95	1.33	5.70	5.38	1.08	6.32	2.79	6.38	1.79	3.69
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	2.06	1.61	3.23	3.17	2.00	3.07	2.31	3.04	1.05	3.72	2.13	4.91	4.53
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0.384	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0.825	0	0	0	0	0	0.384	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0.342	0	0	0	0	0.549	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0.444	3.76	1.74	5.56	1.75	0.877	5.49	2.65	1.80	0.512	1.77	6.20	11.2
Insecta	Plecoptera	Capniidae	Paracapnia	5.33	5.13	0.496	2.78	0.583	0.877	1.65	6.89	18.6	14.3	3.55	8.53	13.1
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0.397	0	0	0	0.217	0	0	1.06	0	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0.608	0.803	0	0.397	0	1.32	0	0.506	0.646	1.11	0	1.52	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0.803	0	0.397	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	33.4	6.43	0.993	0.794	2.33	0	5.38	16.2	11.6	9.42	23.4	13.7	5.37
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	based Kick Sai	nples					
			Lowest Practical Level							2021						
Higher Level	Classification	Family	Identification	RG_GHFF				GHUT						GHNF		
				RG_GHFF-6	RG_GHUT-1		RG_GHUT-3	RG_GHUT-4			RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0.201	0.248	0	0	0.439	0.769	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0.247	1.20	1.49	3.97	0.333	2.63	5.00	3.69	4.56	0.310	5.32	0.473	2.01
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0.990	0.201	0	0	0.333	0	0	0.0271	0	0	0	7.56	0.168
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0.619	0.402	0	0	0	0.877	1.15	0.867	0.702	1.55	2.13	2.68	1.17
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0.412	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0.744	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0.397	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	1.24	0.402	1.74	4.37	5.33	8.33	5.77	1.30	2.81	0.310	9.57	2.23	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0.825	0.402	0	0	0.333	0	0.769	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	a-based Kick S	amples					
			Lowest Practical Level				)21						2022			
Higher Level	l Classification	Family	Identification				GHFF						GHUT			RG_GHNF
	T										RG_GHUT-2					
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	2.51	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0.377	0.532	0.327	0.810	1.74	17.8	3.01	0.980	4.35	3.41	2.06	0
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0.188	0	0	0	0	0	0	0.980	0	0	0	1.43
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0.405	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	1.07	0.377	2.13	0.654	0.810	0.651	0.297	0	0	0	0.201	0.229	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0	0	0	0	0.201	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0	0	0	1.09	0	0.229	1.43
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
			Probezzia	0	0	0	0	0	0	0.297	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae Chironomidae	Apedilum	0	0	0	0	0	0	0.297	0	0	0	0	0	0
Insecta	Diptera					0	0		-		0	ŭ		· ·	-	
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	Ū	•	0	0	0	ū	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0		1.07	2.10	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0.318	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	37.5	54.8	33.0	50.0	51.0	27.5	28.6	25.6	1.05	9.21	31.3	19.2	25.9
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0.925	0	0	0	1.72	3.82	5.33	17.8	3.95	0	0.526	9.71
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	11.1	0.601	0	1.43	1.96	0	0	0	0	0.497	4.73	1.62
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	10.8	1.85	3.60	6.48	3.82	11.8	18.8	9.60	0	1.32	5.47	8.42	1.62
Insecta	Diptera	Chironomidae	Pagastia	34.6	16.6	18.6	25.9	18.6	30.9	9.55	13.9	0	7.89	25.9	28.4	4.86
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0.491	3.18	6.67	9.43	17.1	0	0.263	0
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0.491	0	0.07	0	0	0	0.203	0
	· ·			0	0	0	0	0	0	0	0	0	0	0	0	
Insecta	Diptera	Chironomidae	Rheocricotopus			-		-	-	0		-	_		-	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	ŭ	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0.526	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	a-based Kick S	amples					
			Lowest Practical Level				)21						2022			7
Higher Lev	el Classification	Family	Identification				GHFF						GHUT			RG_GHI
												RG_GHUT-3				
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0.925	0	0	0	0	1.27	4.27	0	10.5	4.72	8.42	4.86
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0.188	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	6.79	1.51	11.2	4.58	5.26	7.81	0.297	0	0	2.17	6.02	8.70	8.57
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	2.01	2.94	2.17	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0.377	0	0	0	0	0	0	0.980	0	0	0.229	1.43
Insecta	Diptera	Psychodidae	Pericoma	0	3.39	1.60	0.980	2.83	2.60	2.37	6.02	22.6	23.9	4.42	5.49	5.71
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0.188	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0.327	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0.327	0	0	0	0	0	0	0	0	0
Insecta	•	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diptera	,	<b>.</b>	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	_		0	_		<u> </u>	-	_	-	_	-	
Insecta	Diptera	Tipulidae	Dicranota	0	0.188	0.532	-	0.405	0	0	5.01	7.84	3.26	0.201	1.14	0
Insecta	Diptera	Tipulidae	Limnophila		0	0	0	0	0	0	0	0	0		0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0.532	0	0	0.217	0	0	0	0	1.20	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0.402	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	1.06	0	0	0.651	0	3.01	11.8	5.43	0	0	1.90
Insecta	Plecoptera	Capniidae	Paracapnia	0	0.377	0	0	0.405	0.001	11.3	3.01	0	0	0.201	0.915	3.81
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0.377	0.532	0	0.403	0	0	2.01	0	0	0.402	0.229	0.01
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0.332	0	0	0	0	0	0	0	0.402	0.229	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0
				0	_	0	_	0		0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka		0.565		0.955	_	1.47	<u> </u>						
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	7.14	2.82	20.2	5.25	10.1	7.64	0.890	0	0	1.09	8.43	4.35	5.71
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area	a-based Kick Sa	amples					
			Lowest Practical Level			20	21						2022			
Higher Level (	Classification	Family	Identification			RG_0							GHUT			RG_GHNF
				RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1			RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0.593	1.00	1.96	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0.357	0	0.532	0	0.405	0.651	0.297	3.01	9.80	5.43	3.01	2.75	8.57
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.377	0	0.327	0	0	0	1.00	0	0	0.201	0.915	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	1.43	1.51	1.06	3.92	1.62	2.17	0.297	2.01	0	0	1.81	1.37	5.71
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	1.43
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	1.13	1.60	0	1.62	0	0	0	8.82	1.09	0.803	0	2.86
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0.357	0.188	2.66	0.327	0.405	0	0	0	0.980	0	1.20	0.915	2.86
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-	pased Kick San 2022	nples					
Higher Level (	Classification	Family	Lowest Practical Level			RG_GHNF				2022	RG (	GHFF			RG	GHDT
inglier Level v	Jiassinoution	1 anniy	Identification	RG GHNF-2	RG GHNF-3		RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2	RG_GHFF-3		RG GHFF-5	RG GHFF-6	_	
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	1.87	0.781	1.65	2.37	3.08	0.692	2.07	3.41	2.06	3.41	2.06
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0.494	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	_	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.494	0	1.87	0	0	0	0	0.692	0.826	0.201	0.229	0.201	0.229
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0.494	0	0	0	0	0	0	0.092	0.620	0.201	0.229	0.201	0.229
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0.413	0.201	0	0.201	0
		Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera					Ū										
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0	0	0	0 242	0	0	0	0 000	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0.342	0	0.826	0	0.229	0	0.229
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	0	0	0.483	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0.563	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	1.12	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Diplocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	54.6	69.1	16.8	18.4	36.8	45.2	20.8	61.1	15.0	31.3	19.2	31.3	19.2
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	3.36	0.877	0.968	0.377	0	0	1.45	0	0.526	0	0.526
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0.483	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	0	0	2.24	0	0	1.88	0	0	4.83	0.497	4.73	0.497	4.73
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	1.69	14.5	3.36	7.02	8.71	3.01	1.39	5.78	10.1	5.47	8.42	5.47	8.42
Insecta	Diptera	Chironomidae	Pagastia	11.3	3.03	14.6	21.1	12.6	16.2	19.0	14.9	6.28	25.9	28.4	25.9	28.4
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0.20	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0			0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum						ŭ	-	0	0 493	-	-		_
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	1.12	0	0	0	0	0	0.483	0	0.263	0	0.263
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0.526	0	0.526
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-l	pased Kick San 2022	nples					
Higher Level	Classification	Family	<b>Lowest Practical Level</b>			RG_GHNF				2022	RG_0	SHEE			RG.	GHDT
riigilei Levei	Olassification	1 annly	Identification	RG GHNF-2	RG GHNF-3	RG GHNF-4	RG GHNF-5	RG GHNF-6	RG GHFF-1	RG GHFF-2	RG_GHFF-3		RG GHFF-5	RG GHFF-6	_	
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	8.44	1.21	5.61	9.65	7.74	1.13	2.31	1.65	0.966	4.72	8.42	4.72	8.42
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	2.24	0	0.968	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0.552	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	2.96	0.552	10.3	6.25	4.13	5.93	16.1	5.19	10.1	6.02	8.70	6.02	8.70
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	1.19	0	0	0.632	0	0.70	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
	·		Glutops	0	0	0.935	2.34	0.826	0.339	1.03	0.346	1.24	0	0.229	0	0.229
Insecta	Diptera	Pelecorhynchidae	Pericoma	0	0.552	4.67	3.12	1.65	1.69	3.08	1.04	20.7	4.42	5.49	4.42	5.49
Insecta	Diptera	Psychodidae				0							0		+	
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	Ū	0	0	0	0	0	0	ŭ	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0.494	0	0.935	1.56	0.826	0	1.37	0	0	0.201	1.14	0.201	1.14
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0	0	0	0	0	0.413	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0.935	0	0	0.339	1.37	0	0.826	1.20	0	1.20	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0.955	0	0	0.339	1.03	0	0.020	0.402	0	0.402	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0.559	0	0	0	0.402	0	0.402	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta			Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ephemeroptera	Heptageniidae	•		0	0	0	-	0				0		-	
Insecta	Plecoptera	Capniidae	Capnia	0	-	0	_	0	0	0	0	0	_	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	Ū	0	0	ŭ	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	1.48	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0.552	7.48	8.59	3.31	1.36	1.71	0.346	2.07	0.201	0.915	0.201	0.915
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0.781	0	0	1.03	0	2.07	0.402	0.229	0.402	0.229
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0.413	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	4.94	2.21	7.48	0.781	9.92	12.2	9.93	5.54	7.02	8.43	4.35	8.43	4.35
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-b	ased Kick Sam	ples					
			Lowest Practical Level							2022						
Higher Level	Classification	Family	Identification			RG_GHNF					RG_					_GHDT
			Taomin Garien	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHDT-1	RG_GHDT-
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	6.36	0.552	8.41	0.781	1.65	0.814	0.716	1.38	0.826	3.01	2.75	3.01	2.75
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0.796	3.31	0	3.12	2.48	1.22	7.16	0	4.13	0.201	0.915	0.201	0.915
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	4.44	3.31	0.935	3.91	2.48	0.678	0	0.346	0.413	1.81	1.37	1.81	1.37
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0.826	0.339	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0	0	0	0	0	0.413	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0.494	0	2.80	6.25	0	0	0.342	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0.494	0.552	0	3.91	1.65	1.69	0.685	1.04	1.24	0.803	0	0.803	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0.935	0.781	0.826	1.69	7.53	0	3.31	1.20	0.915	1.20	0.915
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon			Area-based	Kick Samples	
			Lowest Practical Level			122	
Higher Level	Classification	Family	Identification			GHDT	
					RG_GHDT-4		
Clitellata	Tubificida	Naididae	Nais	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	1.87
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0
Collembola	Collembola	-	Collembola	1.43	0.494	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	Hygrobates	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0.494	0	1.87
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Dytiscidae	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	1.43	0	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Culicoides	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0
Insecta	Diptera	Chironomidae	Apedilum	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0.563	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0.303	0	1.12
Insecta	Diptera	Chironomidae	Chironomus	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0
	•	Chironomidae	Diplocladius	0	0	0	0
Insecta	Diptera	Chironomidae		25.9	-		
Insecta	Diptera		Eukiefferiella		54.6	69.1	16.8
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	9.71	0	0	3.36
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0
Insecta	Diptera	Chironomidae	Metriocnemus	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	1.62	0	0	2.24
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	1.62	1.69	14.5	3.36
Insecta	Diptera	Chironomidae	Pagastia	4.86	11.3	3.03	14.6
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	1.12
Insecta	Diptera	Chironomidae	Psilometriocnemus	0	0	0	0
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0
	Diploid	Simononidae	ranytarous	1	1	U	

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

					Area-based	Kick Samples	
			Lowest Practical Level			22	
Higher Level	Classification	Family	Identification			GHDT	
							RG_GHDT-6
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	4.86	8.44	1.21	5.61
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	2.24
Insecta	Diptera	Dixidae	Dixa	0	0	0.552	0
Insecta	Diptera	Empididae	Chelifera/Metachela	8.57	2.96	0.552	10.3
Insecta	Diptera	Empididae	Clinocera	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0
Insecta	Diptera	Empididae	Trichoclinocera	0	0	0	0
Insecta	Diptera	Empididae	Wiedemannia	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	1.43	0	0	0.935
Insecta	Diptera	Psychodidae	Pericoma	5.71	0	0.552	4.67
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0
Insecta	Diptera	Sciomyzidae	Sciomyzidae	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0	0.494	0	0.935
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0
Insecta	Diptera	Tipulidae	Molophilus	0	0	0	0
Insecta	Diptera	Tipulidae	Pedicia	0	0	0	0
Insecta	Diptera	Tipulidae	Rhabdomastix	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletus	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0.935
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0
Insecta	Plecoptera	Capniidae	Eucapnopsis	0	0	0	0
Insecta	Plecoptera	Capniidae	Mesocapnia	1.90	1.48	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	3.81	0	0.552	7.48
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0.332	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0
Insecta	Plecoptera	Nemouridae	Visoka	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	5.71	4.94	2.21	7.48
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0
	Plecoptera	Nemouridae	Zapada cincupes  Zapada columbiana	0	0	0	0
Insecta	•						
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0

Table G.11: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon			Area-based I	Kick Samples	
Higher Level	Classification	Family	Lowest Practical Level			22 GHDT	
			identification	RG_GHDT-3	RG_GHDT-4	RG_GHDT-5	RG_GHDT-6
Insecta	Plecoptera	Peltoperlidae	Yoraperla	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	8.57	6.36	0.552	8.41
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0.796	3.31	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	5.71	4.44	3.31	0.935
Insecta	Trichoptera	Apataniidae	Pedomoecus	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Anagapetus	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosoma	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	1.43	0.494	0	2.80
Insecta	Trichoptera	Limnephilidae	Homophylax	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	2.86	0.494	0.552	0
Insecta	Trichoptera	Limnephilidae	Philocasca	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Psychoglypha	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	2.86	0	0	0.935
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon										Density								
											2016								
Higher Level (	Classification	Family			RG_	GHUT					RG_0	GHNF					RG_GHFF		
			RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5
Clitellata	Tubificida	Naididae	0	0	0	57	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	347	254	92	57	137	79	80	60	93	33	76	174	12	13	61	195	48
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	32	0	46	0	20	0	0	20	27	7	12	44	24	17	23	0	21
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	0	13	0	36	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	32	0	46	0	0	20	13	0	0	0	0	0	6	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	13	0	10	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	2,928	841	481	1,648	1,118	1,379	560	653	800	259	1,354	2,004	1,406	817	2,148	2,644	2,153
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	32	43	23	0	0	0	93	27	27	34	182	131	126	83	61	163	131
Insecta	Diptera	Muscidae	0	0	23	0	26	59	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	22	0	0	0	0	13	37	13	0	48	0	36	10	8	0	0
Insecta	Diptera	Psychodidae	63	0	115	170	0	59	13	13	13	0	0	131	12	0	0	11	14
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	11	0
Insecta	Diptera	Stratiomyidae	0	0	0	114	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	284	216	183	398	235	98	293	303	360	20	154	392	36	7	14	54	34
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	39	0	0	0	0	0	0	0	0	8	0	0
Insecta	Ephemeroptera	Ephemerellidae	32	0	0	0	0	39	0	7	0	0	0	0	18	0	0	11	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	504	402	252	1,818	275	217	427	163	200	177	201	1,046	42	3	8	65	14
Insecta	Plecoptera	Chloroperlidae	0	0	23	0	0	0	13	0	27	17	10	0	6	0	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	57	0	0	0	0	0	7	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	63	21	23	398	353	414	80	13	13	0	10	305	48	13	15	65	75
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	46	23	0	3	0	187	163	373	50	267	392	6	17	0	90	96
Insecta	Plecoptera	Taeniopterygidae	158	21	0	57	39	0	0	30	0	7	19	0	36	7	107	141	21
Insecta	Trichoptera	Apataniidae	0	21	0	170	0	20	0	0	0	10	10	0	0	10	0	0	7
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0
Insecta	Trichoptera	Hydropsychidae	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	32	0	0	227	78	20	0	0	13	7	10	0	36	13	8	11	41
Insecta	Trichoptera	Rhyacophilidae	63	0	0	0	0	0	0	0	0	0	0	0	39	13	69	0	14
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-		Concilibola	U	U	U	U	U	U		U	U	J	J	U			3	U	U

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon										Density								
			2016																
Higher Level C	Classification	Family	RG_GHFF			RG_	GHUT					RG_	GHNF				RG_0	SHFF	
			RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	8	160	280	97	303	90	80	0	10	57	37	23	17	7	0	7	10
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	10	0	0	0	3	0	0	0	0	7	0	3	0	3	3	10
Euchelicerata	Trombidiformes	Sperchontidae	0	0	10	0	0	0	0	0	0	0	0	0	3	0	3	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	10	0	33	0	0	0	0	0	0	0	3	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	3	0	3	10	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	10	0	0	0	3	0	0	0	7	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	1,033	2,397	1,413	913	5,897	983	2,330	123	183	347	117	190	177	623	820	383	933
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	25	30	27	13	0	13	20	3	20	0	17	3	3	27	57	20	63
Insecta	Diptera	Muscidae	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	33	0	0	0	7	7	7	3	0	0	23	0	3
Insecta	Diptera	Psychodidae	0	23	30	3	100	10	30	0	7	50	3	13	7	0	3	0	3
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	23	0	0	0	0	10	3	0	0	0	10	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	3	80	137	80	473	30	90	7	7	330	13	33	0	10	40	10	17
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	13	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3	0	3
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	3	0	7	0	3	13	17	7	7
Insecta	Plecoptera	Capniidae	8	927	290	203	3,943	220	297	180	183	1,590	303	767	900	23	147	23	33
Insecta	Plecoptera	Chloroperlidae	0	0	7	0	67	13	10	0	0	0	13	0	3	0	10	0	3
Insecta	Plecoptera	Leuctridae	0	0	13	0	33	10	0	0	0	0	0	0	0	0	10	3	0
Insecta	Plecoptera	Nemouridae	41	80	37	17	170	80	227	0	0	0	3	30	37	13	93	43	60
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	21	0	0	0	67	3	20	33	30	40	3	13	23	20	17	17	40
Insecta	Plecoptera	Taeniopterygidae	58	10	0	10	33	3	0	17	0	0	0	7	17	60	23	3	60
Insecta	Trichoptera	Apataniidae	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	4	0	7	10	0	40	60	0	0	17	0	0	0	3	0	7	7
Insecta	Trichoptera	Rhyacophilidae	17	23	0	3	33	0	0	0	0	0	3	0	0	13	23	20	33
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
=	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon									Density							
			20	2017         2018           RG_GHFF         RG_GHUT         RG_GHNF													
Higher Level C	classification	Family	RG_0	GHFF			RG_0	GHUT					RG_0	GHNF			RG_GHFF
			RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	=	Enchytraeidae	0	3	240	800	53	27	640	320	0	0	160	0	53	0	7
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	7	0	0	0	0	0	0	0	0	0	0	27	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	53	53	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	320	643	2,240	2,560	1,840	2,320	9,813	6,400	2,773	3,120	560	1,387	1,120	1,433	1,453
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	23	33	27	0	27	53	0	0	0	0	0	0	0	0	140
Insecta	Diptera	Muscidae	0	0	0	0	0	0	107	0	0	0	27	0	0	108	0
Insecta	Diptera	Pelecorhynchidae	0	7	0	0	0	0	0	0	0	0	0	0	27	0	0
Insecta	Diptera	Psychodidae	0	0	0	53	187	27	320	0	133	53	187	27	80	243	0
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0	23	880	373	187	427	747	267	293	213	453	213	107	162	80
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	3	0	0	0	0	0	0	0	0	0	0	0	0	27
Insecta	Ephemeroptera	Heptageniidae	3	27	27	0	0	0	0	0	0	0	0	0	0	0	20
Insecta	Plecoptera	Capniidae	0	43	1,600	427	773	427	2,027	587	720	1,440	667	560	347	667	233
Insecta	Plecoptera	Chloroperlidae	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Plecoptera	Nemouridae	7	50	53	107	27	0	320	480	133	27	80	27	187	133	627
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	23	27	0	80	27	107	53	107	107	187	53	133	80	40
Insecta	Plecoptera	Taeniopterygidae	13	133	0	0	0	0	0	53	107	27	53	0	80	187	140
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	_	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	3	3	0	0	27	0	107	0	27	27	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	3	17	27	0	0	0	0	0	0	0	0	0	0	0	13
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	80	0	0	0	53	27	0	453	27	27	0
-		Concilibula		J	<u> </u>	<u> </u>	00	U	0	U	1 33	21	0	700	۷.	<u> </u>	

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon									Density								
					2018								2019					
Higher Level C	Classification	Family			RG_GHFF					RG_0	GHUT					RG_GHNF		
			RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	4 RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0	7	7	213	400	40	133	227	433	27	13	0	3	3
Euchelicerata	Trombidiformes	Hydryphantidae	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	3	0	0	3	0	0	13	13	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	3	0	0	0	0	0	0	13	0	7	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	3	0	0	7	0	0	0	0	13	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	1,747	800	1,070	957	660	3,440	4,027	1,933	2,173	2,107	2,973	10,880	1,359	9,600	203	120
Insecta	Diptera	Dixidae	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	67	30	30	17	83	0	27	40	0	0	0	80	13	0	13	0
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	0	0	10	0	7	53	133	160	53	27	27	400	108	133	40	20
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	13	0	23	17
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	13	17	17	13	47	267	187	187	160	107	73	133	0	53	3	0
Insecta	Ephemeroptera	Ameletidae	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	7	0	0	0	0	0	0	0	0	0	0	3	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	13	7	0	0	0	13	13	0	0	13	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	13	10	10	7	0	0	0	0	0	0	0	0	0	3	0
Insecta	Plecoptera	Capniidae	93	50	23	47	33	560	400	240	240	160	120	560	320	1,040	320	90
Insecta	Plecoptera	Chloroperlidae	13	3	0	17	10	0	0	0	0	0	0	0	13	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	840	477	310	187	153	53	53	67	173	80	160	133	387	853	167	37
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	67	23	20	33	67	27	0	0	3	0	0	133	67	80	23	13
Insecta	Plecoptera	Taeniopterygidae	253	113	50	43	50	80	107	0	13	13	13	27	67	53	33	13
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	13	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	13	3	0	0	0	0	27	133	80	27	27	0	67	107	10	10
Insecta	Trichoptera	Rhyacophilidae	53	17	3	27	13	0	0	0	7	13	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	13	0	0	0	0	53	0	0	0	0	27	0	7	60

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon										Density								
						2019								2	020				
Higher Level C	Classification	Family	RG_GHNF			RG_	GHFF					RG_C	<b>GHUT</b>				RG_	GHNF	
			RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	120	0	3	0	100	10	347	293	267	293	240	1,707	107	67	53	0
Euchelicerata	Trombidiformes	Hydryphantidae	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	3	3	7	0	27	0	53	0	0	0	0	0	0	13
Euchelicerata	Trombidiformes	Sperchontidae	0	53	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	0	0	0	0	0	27	107	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	6,293	5,040	227	593 0	467	3,087	1,150	3,440	1,493	4,213	3,440	6,827	17,173	2,773	720	120	224
Insecta	Diptera	Dixidae	0	0 147	0	-	0	0	0	0	0	0	0	0	0	0		147	0
Insecta	Diptera	Empididae	27 0		20	3	23	147	30	80	27	0	0	0	0	160	53	147	84
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	27 0	0	0 53	0	0	0	0 107	53	13	0
Insecta	Diptera	Pelecorhynchidae		<b>.</b>		3	7	ļ	-										-
Insecta	Diptera	Psychodidae	480	80	0	0	0	13	20 0	53	200	1,120 0	613 0	933	2,133	267 0	08	133	98
Insecta	Diptera	Sciomyzidae Simuliidae	80	0	0	0	0	0	7	27	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	160	267	0	13	0	153	17	400	163	1,227	350	880	1,387	2,027	280	347	140
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	27	0	0	0	0	0	53	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	27	0	0	0	13	0	27	0	0	0	27	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	3	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	1,013	133	3	33	10	213	10	213	133	907	880	907	2,453	2,827	667	547	227
Insecta	Plecoptera	Chloroperlidae	0	13	0	0	3	7	0	0	13	0	27	0	0	0	0	27	0
Insecta	Plecoptera	Leuctridae	0	0	3	0	0	0	0	0	0	53	0	0	0	0	27	13	0
Insecta	Plecoptera	Nemouridae	613	1,773	143	87	103	1,307	317	80	27	373	347	240	640	587	53	53	240
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	107	17	10	0	10	47	3	0	13	160	80	0	0	320	67	93	120
Insecta	Plecoptera	Taeniopterygidae	53	40	17	3	10	13	13	0	0	0	0	0	0	0	0	0	13
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	13	0	0	0	0	0	0	0	0	0	0	0	53	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	107	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0	13	0	13	3	0	7	0	13	803	693	1,413	853	53	53	27	13
Insecta	Trichoptera	Rhyacophilidae	0	43	7	0	10	7	3	0	0	0	0	0	3	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0
-	-	Collembola	293	13	0	3	3	0	3	0	40	0	0	0	0	0	0	0	0

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon										Density								
						20	20								2021				
Higher Level Cl	lassification	Family	RG_G	HNF			RG_	GHFF					RG_0	GHUT				RG_GHNF	
			RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	1	Enchytraeidae	80	27	80	0	7	67	7	67	432	132	216	120	24	144	120	96	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	13	13	40	7	0	13	27	24	0	48	0	0	24	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	7	0	0	0	0	0	0	24	0	24	24	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	13	0	0	0	7	40	24	120	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	14	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	433	160	1,933	1,240	2,027	2,267	1,540	3,000	8,376	3,816	4,008	5,952	4,128	3,744	6,456	6,816	10,080
Insecta	Diptera	Dixidae	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	27	13	307	280	220	320	100	253	72	60	48	48	0	96	432	144	144
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	120	0	0	24	0	24	0	0	0
Insecta	Diptera	Pelecorhynchidae	54	0	80	0	0	27	7	0	0	0	0	0	0	3	0	48	0
Insecta	Diptera	Psychodidae	54	13	173	0	0	160	27	40	312	192	360	96	312	336	120	864	432
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	338	253	80	80	13	200	40	133	192	156	192	144	168	168	336	144	576
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	67	107	27	93	40	53	0	0	0	0	0	24	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	773	373	173	427	7	133	20	373	1,104	108	504	168	96	480	1,056	2,784	2,304
Insecta	Plecoptera	Chloroperlidae	0	0	13	0	0	0	7	0	0	0	24	0	0	0	24	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	13	0	0	7	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	0	173	1,040	2,200	380	800	207	2,200	960	48	96	168	72	336	1,848	1,680	1,632
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	7	0	0	0	24	12	0	0	24	48	0	0	0
Insecta	Plecoptera	Perlodidae	40	40	40	80	20	40	0	80	168	72	240	48	144	312	411	624	48
Insecta	Plecoptera	Taeniopterygidae	0	13	0	13	0	53	7	40	48	0	0	0	48	72	96	96	240
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	13	0	27	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	36	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	53	0	107	93	53	13	0	80	48	84	288	384	456	360	144	384	48
Insecta	Trichoptera	Rhyacophilidae	0	0	27	120	13	13	0	53	48	0	0	24	0	48	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon										Density								
							2021								2	022			
Higher Level (	Classification	Family		RG_GHNF				RG_	GHFF					RG_	GHUT			RG_	GHNF
			RG_GHNF-4	4 RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	48	48	0	6	6	6	24	96	720	36	3	24	48	72	336	144
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	24	0	0	36	6	24	12	24	36	12	0	0	0	0	0	24	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	0	0	0	0	0	0	6	12	48	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	912	1,164	8,232	2,784	1,374	630	1,512	2,220	4,116	2,652	795	93	276	1,308	4,992	2,448	420
Insecta	Diptera	Dixidae	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	24	132	96	228	24	126	84	156	432	12	24	9	24	60	72	192	252
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	6	0	0	0	0	0	0	3	0	0	0	192	165
Insecta	Diptera	Psychodidae	144	48	528	0	54	18	18	84	144	96	72	69	132	456	504	96	84
Insecta	Diptera	Sciomyzidae	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	48	132	648	0	3	6	0	12	0	0	60	24	18	12	120	144	24
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	6	0	0	12	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	120	396	3,480	0	6	12	0	12	36	456	72	36	30	252	744	1,296	72
Insecta	Plecoptera	Chloroperlidae	24	0	0	0	0	6	0	0	0	0	24	0	0	0	0	24	48
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	12
Insecta	Plecoptera	Nemouridae	528	408	768	240	54	228	114	300	504	36	0	0	6	0	192	48	12
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	24	12	6	0	24	24	0	0
Insecta	Plecoptera	Perlodidae	120	216	312	12	6	6	6	12	36	12	48	30	30	120	312	696	156
Insecta	Plecoptera	Taeniopterygidae	48	72	168	48	24	12	72	48	120	12	24	0	0	0	0	0	12
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	216	60	0	0	18	18	0	48	0	0	0	27	6	132	168	0	120
Insecta	Trichoptera	Rhyacophilidae	0	0	0	12	3	30	6	12	0	0	0	3	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	48	12	24	0	3	0	0	0	0	0	0	3	0	0	0	24	0

Table G.12: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon									Den	sity							
										20	22							
Higher Level C	Classification	Family		RG_0	3HNF				RG_	GHFF					RG_	GHDT		
			RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHDT-1	RG_GHDT-2	RG_GHDT-3	RG_GHDT-4	RG_GHDT-5	RG_GHDT-6
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	3	48	48	48	21	0	6	15	51	108	0	0	0	6	6	6
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	6	6	3	12	0	6	0	6	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	0	6	0	12	12	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	3	0	144	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	135	5,040	9,168	7,296	600	0	723	291	1,014	3,696	408	930	477	162	438	246
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Insecta	Diptera	Empididae	39	144	192	384	63	0	45	78	90	456	72	36	3	33	48	15
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	3	0	0	57	3	0	3	9	0	12	12	0	0	3	18	3
Insecta	Diptera	Psychodidae	9	96	288	48	15	0	9	150	66	288	48	0	3	15	24	6
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	6	96	48	144	0	0	0	3	3	60	0	6	0	3	12	3
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	3	0	0	6	18	0	0	0	0	3	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	3	0	0	0	6	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	15	1,296	288	2,064	12	0	3	15	3	48	48	18	3	24	66	12
Insecta	Plecoptera	Chloroperlidae	0	0	0	0	0	0	0	15	6	12	0	0	0	0	6	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	12	96	0	144	108	0	48	51	126	228	48	60	12	24	6	36
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	138	1,491	816	1,443	18	0	12	36	48	192	72	87	21	27	30	15
Insecta	Plecoptera	Taeniopterygidae	0	0	48	0	6	0	3	3	27	72	48	54	18	3	30	9
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	3
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	3	0	0	0	15	0	9	9	12	0	36	12	3	9	78	6
Insecta	Trichoptera	Rhyacophilidae	0	0	0	0	15	0	0	24	18	48	24	0	0	3	6	3
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	3	0	0	0	0	0	0	0	0	0	12	6	0	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Three	-minute Kick Sa	mples						
			2012		20	14			20	15			2021			2022	
Higher Level	Classification	Family	RG_GHCKU	GREE3-25	GREE3-75	GREE4-25	GREE4-75	RG_GHCKU	GREE3-75	GREE4-25	GREE4-75		RG_GHNF			RG_GHNF	
			RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	0	0	1.13	0	0.289	0	0	0.254	0.338	0	0.496	0.605	0.643	2.62	1.11
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	0.946	0.761	0.338	0	0	0	1.29	0	0
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0.847	0	0.403	0	0.581	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0.289	0	0	0	0	0	0	0	0	0.291	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0.156	0.289	0.287	0	0	0	0	0	0	0	0.581	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0.156	0	0.287	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0.313	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0.338	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0.156	0	0	0	0.254	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0.157	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	89.0	73.3	34.0	71.3	68.5	65.3	64.3	58.6	45.5	17.8	39.6	45.2	27.0	43.3	80.1
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0.282	0	0	0	0	0
Insecta	Diptera	Empididae	0.313	0.637	0.567	0.784	0	1.72	2.22	0	6.45	0	0.748	1.41	7.72	6.69	0.923
Insecta	Diptera	Muscidae	0	0.319	0	0	3.18	0	0	3.30	0	0.565	0	0	0	0	0.185
Insecta	Diptera Diptera	Pelecorhynchidae	0 1.57	0 1.91	0 1.70	0 1.25	0 1.73	0 3.72	0.317	0 3.55	0.339 2.38	10.2	0 8.97	0 2.82	0.643 1.29	1.16 7.85	0 1.85
Insecta Insecta	Diptera	Psychodidae Sciomyzidae	0	0	0	0	0	0	0.317	0.55	0	0	0.97	0	0	0	0
Insecta	Diptera	Simuliidae	0.313	4.46	1.13	2.82	0	0.860	0.317	0	6.45	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0.515	0	0	0	0	0.860	0.517	0	0.45	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0.940	0.319	2.27	1.10	0.867	2.58	1.27	0.254	10.9	4.52	3.74	4.44	0.643	2.33	0.185
Insecta	Ephemeroptera	Ameletidae	0.540	0.515	0	0	0.007	0	0	0.254	0.338	0	0	0	0.043	0	0.103
Insecta	Ephemeroptera	Baetidae	1.88	0.317	1.13	0.939	0	0	0.315	0	1.01	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0.635	0	0.933	0.578	1.15	0.946	0.254	1.01	0	0	0	0.643	0	0
Insecta	Ephemeroptera	Heptageniidae	3.45	1.90	0.567	1.88	1.16	0.860	2.52	0.254	0.338	0	0	0	0.010	0	0
Insecta	Plecoptera	Capniidae	0.627	5.71	17.6	12.2	10.1	1.43	2.84	16.5	20.3	49.5	19.8	12.4	28.9	8.43	4.67
Insecta	Plecoptera	Chloroperlidae	0	0	0	0.469	0	0	1.58	0.254	0.338	0.291	0.251	0	4.09	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0.874	0.753	0.639	0	0	0
Insecta	Plecoptera	Nemouridae	0	7.62	21.5	0.939	8.09	9.46	4.73	14.2	2.36	7.86	19.3	16.2	3.07	0.581	0.373
Insecta	Plecoptera	Peltoperlidae	0	0	0	0.156	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	0.635	2.83	1.10	0.867	2.87	1.89	1.27	0	4.95	4.27	6.61	21.5	11.3	10.6
Insecta	Plecoptera	Taeniopterygidae	0	1.59	12.8	2.19	3.47	8.60	12.3	0	1.01	2.33	0.502	8.95	0	0	0
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0.283	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0.573	0.868	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0.313	0	2.55	0	0.578	0	0.434	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.627	0.317	0	0.939	0	0	1.74	0.254	0	0	1.49	0.403	2.57	13.9	0
Insecta	Trichoptera	Rhyacophilidae	0.627	0.317	0	1.25	0	0.287	0.434	0	0.338	0	0	0	0	0.317	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick Sar	mples						
										2016							
Higher Level (	Classification	Family			RG_0	SHUT					RG_0	GHNF				RG_GHFF	
			RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3
Clitellata	Tubificida	Naididae	0	0	0	1.10	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	7.59	13.3	6.90	1.10	6.01	3.20	4.51	4.01	4.70	5.32	3.19	3.77	0.634	1.30	2.39
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0.690	0	3.45	0	0.858	0	0	1.34	1.34	1.06	0.498	0.943	1.27	1.63	0.896
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	0	0.671	0	1.49	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0.800	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0.690	0	3.45	0	0	0.800	0.752	0	0	0	0	0	0.317	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0.671	0	0.419	0	0	0	0
Insecta	Diptera	Chironomidae	64.1	44.1	36.2	31.9	48.9	56.0	31.6	43.6	40.3	41.3	56.5	43.4	74.5	79.8	84.2
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0.690	2.26	1.72	0	0	0	5.26	1.78	1.34	5.43	7.61	2.83	6.65	8.14	2.39
Insecta	Diptera	Muscidae	0	0	1.72	0	1.15	2.40	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	1.13	0	0	0	0	0.752	2.45	0.671	0	2.00	0	1.90	0.977	0.299
Insecta	Diptera	Psychodidae	1.38	0	8.62	3.30	0	2.40	0.752	0.891	0.671	0	0	2.83	0.634	0	0
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0.445	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	2.20	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	6.21	11.3	13.8	7.69	10.3	4.00	16.5	20.3	18.1	3.26	6.41	8.49	1.90	0.651	0.560
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	1.60	0	0	0	0	0	0	0	0	0.299
Insecta	Ephemeroptera	Ephemerellidae	0.690	0	0	0	0	1.60	0	0.445	0	0	0	0	0.951	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	11.0	21.1	19.0	35.2	12.0	8.80	24.1	10.9	10.1	28.2	8.36	22.6	2.22	0.326	0.299
Insecta	Plecoptera	Chloroperlidae	0	0	1.72	0	0	0	0.752	0	1.34	2.66	0.398	0	0.317	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	1.10	0	0	0	0	0	1.06	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	1.38	1.11	1.72	7.69	15.4	16.8	4.51	0.891	0.671	0	0.398	6.60	2.54	1.30	0.597
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	2.39	1.72	0	0.146	0	10.5	10.9	18.8	7.98	11.2	8.49	0.317	1.63	0
Insecta	Plecoptera	Taeniopterygidae	3.45	1.11	0	1.10	1.72	0	0	2.00	0	1.06	0.797	0	1.90	0.651	4.18
Insecta	Trichoptera	Apataniidae	0	1.11	0	3.30	0	0.800	0	0	0	1.60	0.398	0	0	0.977	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.896
Insecta	Trichoptera	Hydropsychidae	0	1.11	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.690	0	0	4.40	3.43	0.800	0	0	0.671	1.06	0.398	0	1.90	1.30	0.299
Insecta	Trichoptera	Rhyacophilidae	1.38	0	0	0	0	0	0	0	0	0	0	0	2.08	1.30	2.69
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick Sar	mples						
				2016							20	)17					
Higher Level	Classification	Family		RG_GHFF				RG_0	GHUT					RG_0	GHNF		
			RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	5.64	1.80	0.672	4.24	12.3	7.14	2.71	5.96	2.48	0	2.22	2.32	6.83	2.13	1.39
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0.771	0	0.265	0	0	0	0.221	0	0	0	0	1.24	0	0.279
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0.440	0	0	0	0	0	0	0	0	0	0.279
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0.440	0	0.298	0	0	0	0	0	0	0	0.279
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0.621	0.304	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0.246	0	0.221	0.310	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0.265	0	0	0	0.221	0	0	0	0.273	0	0	0
Insecta	Diptera	Chironomidae	76.4	80.7	83.9	63.5	62.2	67.5	52.7	65.1	72.3	33.2	40.7	14.2	21.7	17.3	14.8
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	4.70	4.90	2.03	0.795	1.17	0.985	0	0.883	0.620	0.923	4.44	0	3.11	0.304	0.279
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	1.24	0	0	0	0	0	0
Insecta	Diptera Diptera	Pelecorhynchidae	0 0.313	0 0.516	0	0 0.618	0 1.32	0.246	0.298 0.894	0.662	0.931	0	1.48 1.48	0.273 2.05	1.24 0.621	0.304 1.22	0 0.557
Insecta Insecta	Diptera	Psychodidae Sciomyzidae	0.313	0.510	0	0.018	0	0.240	0.894	0.002	0.931	0	0	0	0.021	0	0.557
Insecta	Diptera	Simuliidae	0.313	0	0	0.618	0	0	0	0	0.310	0.923	0	0	0	0.912	0
Insecta	Diptera	Stratiomyidae	0.313	0	0	0.010	0	0	0	0	0.510	0.923	0	0	0	0.912	0
Insecta	Diptera	Tipulidae	1.57	1.29	0.273	2.12	6.01	5.91	4.23	1.99	2.79	1.85	1.48	13.5	2.48	3.04	0
Insecta	Ephemeroptera	Ameletidae	0	0	0.275	0	0.01	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0.587	0	0	0	0	0.901	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0.313	0	0	0	0.307	0	0	0.221	0	0.501	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0.313	0	0	0	0	0	0	0.221	0	0	0.741	0	1.24	0	0.279
Insecta	Plecoptera	Capniidae	1.88	0.514	0.672	24.6	12.8	15.0	35.2	14.6	9.20	48.6	40.7	65.1	56.5	69.9	75.2
Insecta	Plecoptera	Chloroperlidae	0	0.014	0.072	0	0.293	0	0.596	0.883	0.310	0	0	0	2.48	0	0.279
Insecta	Plecoptera	Leuctridae	0	0	0	0	0.587	0	0.298	0.662	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	1.88	2.83	3.36	2.12	1.61	1.23	1.52	5.30	7.03	0	0	0	0.621	2.74	3.06
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	2.60	3.60	1.68	0	0	0	0.596	0.221	0.620	9.01	6.67	1.64	0.621	1.22	1.95
Insecta	Plecoptera	Taeniopterygidae	4.07	0.771	4.70	0.265	0	0.739	0.298	0.221	0	4.50	0	0	0	0.608	1.39
Insecta	Trichoptera	Apataniidae	0	0.257	1.01	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.313	1.54	0.336	0	0.293	0.739	0	2.65	1.86	0	0	0.682	0	0	0
Insecta	Trichoptera	Rhyacophilidae	0	0.514	1.34	0.618	0	0.246	0.298	0	0	0	0	0	0.621	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick Sar	nples						
					20	17							2018				
Higher Level	Classification	Family			RG_C	GHFF					RG_	GHUT				RG_GHNF	
			RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0.820	0	1.22	0.777	0	0.326	4.64	18.5	1.63	0.806	4.49	3.90	0	0	6.74
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0.257	0.610	0.777	0	0.651	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0.257	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	0	0	0	0	0.375	0.649	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	76.6	63.2	70.1	72.5	85.7	62.9	43.3	59.3	56.1	70.2	68.9	77.9	63.8	61.9	23.6
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	3.28	4.37	3.66	4.92	6.25	3.26	0.515	0	0.813	1.61	0	0	0	0	0
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0.749	0	0	0	1.12
Insecta	Diptera Diptera	Pelecorhynchidae	0	1.80 0.257	0	0.259 0.259	0	0.651 0	0	1.23	0 5.69	0.806	0 2.25	0	0 3.07	0 1.06	0 7.87
Insecta Insecta	Diptera	Psychodidae Sciomyzidae	0	0.237	0	0.239	0	0	0	0	0.09	0.800	0	0	0	0	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	1.23	3.08	1.83	1.30	0	2.28	17.0	8.64	5.69	12.9	5.24	3.25	6.75	4.23	19.1
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0.04	0	0	0	0	0.73	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0.257	0	0.259	0	0.326	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	1.64	1.29	1.22	0.518	0.893	2.61	0.515	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	2.87	11.3	4.27	2.59	0	4.23	30.9	9.88	23.6	12.9	14.2	7.14	16.6	28.6	28.1
Insecta	Plecoptera	Chloroperlidae	0	0.771	0	0.259	0	0	1.03	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	0	0.771	0.610	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	1.64	7.20	7.93	4.66	1.79	4.89	1.03	2.47	0.813	0	2.25	5.84	3.07	0.529	3.37
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	2.46	1.29	3.05	3.11	0	2.28	0.515	0	2.44	0.806	0.749	0.649	2.45	2.12	7.87
Insecta	Plecoptera	Taeniopterygidae	7.38	1.80	0.610	4.66	3.57	13.0	0	0	0	0	0	0.649	2.45	0.529	2.25
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0.257	0	0	0	0.651	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.410	0	1.22	0.518	0.893	0.326	0	0	0.813	0	0.749	0	0.613	0.529	0
Insecta	Trichoptera	Rhyacophilidae	1.64	1.80	3.66	2.59	0.893	1.63	0.515	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	2.44	0	0	0	1.23	0.529	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick San	nples						
							2018							20	19		
Higher Level	Classification	Family		RG_GHNF				RG_0	GHFF					RG_0	GHUT		
			RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	2.44	0	0.239	0	0	0	0.480	0.576	4.55	7.46	1.40	4.33	8.13	11.3
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0.423	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	1.22	0	0	0	0.211	0	0	0.288	0	0	0.465	0.433	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0.239	0	0.211	0	0	0	0	0	0	0.433	0	0.173
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0.211	0	0	0.576	0	0	0	0	0.478	0
Insecta	Coleoptera	Staphylinidae	0	0	0.870	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	51.0	51.2	46.7	52.0	55.0	50.7	68.6	68.8	57.1	73.3	75.1	67.4	70.6	75.6	77.3
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0.240	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0	0	0	5.01	2.10	1.90	1.92	1.20	7.20	0	0.498	1.40	0	0	0
Insecta	Diptera	Muscidae	0	0	3.53	0	0	0	0	0	0	0	0	0	0	0	0.347
Insecta	Diptera	Pelecorhynchidae	0 0.980	1.22 3.66	0 7.93	0	0	0.423	0.214	0	0	1.14	0	0 5.58	0 1.73	0 0.957	0
Insecta	Diptera Diptera	Psychodidae	0.980	3.00	7.93	0	0	0	0.641	0	0.576 0	0	2.49	0.58	0	0.957	0.693
Insecta	Diptera	Sciomyzidae Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera	Tipulidae	7.84	4.88	5.29	2.86	0.420	1.06	1.07	0.959	4.03	5.68	3.48	6.51	5.20	3.83	1.91
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0.420	0.211	0	0.939	0	0	0	0.51	0.20	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0.211	0	0.480	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0.955	0	0	0	0.480	0.576	0	0	0	0.433	0.478	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0.933	0	0.846	0.641	0.719	0.576	0	0	0	0.433	0.478	0
Insecta	Plecoptera	Capniidae	20.6	15.8	21.7	8.35	2.94	3.17	1.50	3.36	2.88	11.9	7.46	8.37	7.80	5.74	3.12
Insecta	Plecoptera	Chloroperlidae	0	0	0	0.33	0.420	0.211	0	1.20	0.865	0	0	0.57	0	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0.239	0.420	0.211	0	0	0.288	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	0.980	8.54	4.35	22.4	26.5	30.2	19.9	13.4	13.3	1.14	0.995	2.33	5.63	2.87	4.16
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	1.96	6.10	2.61	1.43	2.10	1.48	1.28	2.40	5.76	0.568	0	0	0.108	0	0
Insecta	Plecoptera	Taeniopterygidae	0	3.66	6.09	5.01	7.98	7.19	3.21	3.12	4.32	1.70	1.99	0	0.433	0.478	0.347
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0.420	0	0	0.719	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0.211	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0	0	0	0	0.420	0.211	0	0	0	0	0.498	4.65	2.60	0.957	0.693
Insecta	Trichoptera	Rhyacophilidae	0	0	0	0.477	1.68	1.06	0.214	1.92	1.15	0	0	0	0.217	0.478	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	16.7	1.22	0.870	0	0	0	0.855	0	0	0	0	1.86	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick San	nples						
								20	19							2020	
Higher Level	Classification	Family			RG_0	SHNF					RG_0	GHFF				RG_GHUT	
			RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHUT-1	RG_GHUT-2	RG_GHUT-3
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	=	Enchytraeidae	0.216	0.541	0	0.391	0.862	0	1.54	0	0.435	0	1.96	0.629	7.22	12.1	2.89
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0.862	0.292	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	0	0	0.435	0.505	0.130	0	0.555	0	0.578
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0.684	0	0.435	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0.555	0	0
Insecta	Diptera	Chironomidae	87.9	55.1	80.5	23.8	31.0	68.8	64.7	52.3	77.4	70.7	60.4	72.3	71.6	61.8	45.6
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0.647	0.545	0	1.56	0	0.292	1.88	4.62	0.435	3.54	2.87	1.89	1.67	1.10	0
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0.555	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.578
Insecta	Diptera	Psychodidae	3.23	4.36	1.12	4.69	5.17	5.25	1.03	0	0.435	1.01	0.261	1.26	1.11	8.28	12.1
Insecta	Diptera	Sciomyzidae	0	0 0.545	0	0	0 4.31	0 0.875	0	0	0	0	, ,	0	0 0.555	0	0
Insecta	Diptera	Simuliidae	0	0.545	0	2.73	0		0	0	0	0	0	0.419	0.555	0	0
Insecta	Diptera	Stratiomyidae	1.08		0.447	0		0 1.75	3.42	0	ů	0	3.00	0 1.05		6.76	0 13.3
Insecta	Diptera	Tipulidae	0	0	0.447	0.391	0	0	3.42 0	0	1.74 0	0	0.00	0	8.33 0	0.76	0
Insecta	Ephemeroptera	Ameletidae	0	0	0	0.391	0	0	0	0	0	0	0	0	0.555	0	0
Insecta Insecta	Ephemeroptera Ephemeroptera	Baetidae Ephemerellidae	0	0.541	0	0.391	0	0	0.342	0	0	0	0.261	0	0.555	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0.541	0	0.391	0	0	0.342	0.769	0	1.01	0.201	0	0.555	0	0
Insecta	Plecoptera	Capniidae	4.53	13.0	8.72	37.5	23.3	11.1	1.71	0.769	4.35	1.52	4.17	0.629	4.44	5.52	9.82
Insecta	Plecoptera	Chloroperlidae	0	0.541	0	0	0	0	0.171	0.769	0	0.505	0.130	0.029	0	0.552	0
Insecta	Plecoptera	Leuctridae	0	0.541	0	0	0	0	0.171	0.769	0	0.303	0.130	0	0	0.332	0.578
Insecta	Plecoptera	Nemouridae	1.08	15.7	7.16	19.5	9.48	6.71	22.8	33.1	11.3	15.7	25.6	19.9	1.67	1.10	4.04
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	1.08	2.70	0.671	2.73	3.45	1.17	0.214	2.31	0	1.52	0.913	0.210	0	0.552	1.73
Insecta	Plecoptera	Taeniopterygidae	0.216	2.70	0.447	3.91	3.45	0.583	0.513	3.85	0.435	1.52	0.261	0.839	0	0	0
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0.171	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0.435	0	0	0	0.0694	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0	2.70	0.895	1.17	2.59	0	0.171	0	1.74	0.505	0	0.419	0	0.552	8.70
Insecta	Trichoptera	Rhyacophilidae	0	0	0	0	0	0	0.556	1.54	0	1.52	0.130	0.210	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0.555	0	0
-	-	Collembola	0	1.08	0	0.781	15.5	3.21	0.171	0	0.435	0.505	0	0.210	0	1.66	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick Sar	nples						
										2020							
Higher Level	Classification	Family		RG_GHUT				RG_0	GHNF					RG_	GHFF		
			RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3	RG_GHFF-4	RG_GHFF-5	RG_GHFF-6
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	4.36	2.09	6.42	1.14	3.14	3.36	0	4.26	2.47	1.92	0	0.239	1.59	0.329	1.03
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0.840	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	1.14	0	1.23	0.319	0.852	0.239	0	0.658	0.412
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0	0	0	0	0	0	0.239	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0.232	0.402	0	0	0	0	0	0	0.319	0	0	0	0.329	0.619
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0.719	0	0.319	0	0	0	0	0
Insecta	Diptera	Chironomidae	51.2	59.4	64.7	29.7	34.0	7.56	19.1	23.0	14.8	46.3	26.4	72.7	54.0	76.0	46.4
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0.719	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0	0	0	1.71	2.52	9.24	7.17	1.44	1.23	7.35	5.97	7.89	7.62	4.93	3.92
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	1.14	2.52	0.840	0	2.88	0	1.92	0	0	0.635	0.329	0
Insecta	Diptera	Psychodidae	9.12	8.12	8.03	2.86	3.77	8.40	8.36	2.88	1.23	4.15	0	0	3.81	1.32	0.619
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae Tipulidae	5.21	7.66	5.22	21.7	13.2	21.9	11.9	18.0	23.5	1.92	1.70	0.478	4.76	1.97	2.06
Insecta		Ameletidae	0	7.00	0	0	0	0	0	0	23.5	0	0	0.476	0	0	0
Insecta	Ephemeroptera Ephemeroptera	Baetidae	0	0	0	0.571	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Ephemeroptera	Ephemerellidae	0	0.232	0	0.571	0	0	0	0	0	1.60	2.27	0.957	2.22	1.97	0.825
Insecta	Ephemeroptera	Heptageniidae	0	0.232	0	0	0	0	0	0	0	0.319	0	0.937	0	0	0.825
Insecta	Plecoptera	Capniidae	13.1	7.89	9.24	30.3	31.4	34.5	19.3	41.1	34.6	4.15	9.09	0.239	3.17	0.987	5.77
Insecta	Plecoptera	Chloroperlidae	0.397	0	0	0	0	1.68	0	0	0	0.319	0	0.239	0	0.329	0
Insecta	Plecoptera	Leuctridae	0.397	0	0	0	1.26	0.840	0	0	0	0.519	0.284	0	0	0.329	0
Insecta	Plecoptera	Nemouridae	5.16	2.09	2.41	6.29	2.52	3.36	20.4	0	16.1	24.9	46.9	13.6	19.1	10.2	34.0
Insecta	Plecoptera	Peltoperlidae	0	0	0	0.23	0	0	0	0	0	0	0	0.239	0	0	0
Insecta	Plecoptera	Perlodidae	1.19	0	0	3.43	3.14	5.88	10.2	2.13	3.70	0.958	1.70	0.718	0.952	0	1.24
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	1.14	0	1.23	0	0.284	0	1.27	0.329	0.619
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0.571	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0.402	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0.317	0	0.412
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	10.3	12.3	3.21	0.571	2.52	1.68	1.14	2.84	0	2.56	1.99	1.91	0.317	0	1.24
Insecta	Trichoptera	Rhyacophilidae	0	0	0.0125	0	0	0	0	0	0	0.639	2.56	0.478	0.317	0	0.825
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon								Area	-based Kick Sar	nples						
										2021							
Higher Level	Classification	Family			RG_0	GHUT					RG_0	GHNF				RG_GHFF	
			RG_GHUT-1	RG_GHUT-2	RG_GHUT-3	RG_GHUT-4	RG_GHUT-5	RG_GHUT-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-4	RG_GHNF-5	RG_GHNF-6	RG_GHFF-1	RG_GHFF-2	RG_GHFF-3
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	3.61	2.73	3.57	1.67	0.439	2.31	1.08	0.702	0	0	1.79	0.336	0	0.377	0.532
Collembola	Collembola	Entomobryidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0.201	0	0.794	0	0	0.384	0	0	0	1.06	0	0	1.07	0.377	2.13
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0.333	0	0.384	0.217	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0.397	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0.201	2.48	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	70.1	78.9	66.3	82.7	75.4	60.0	58.3	49.8	65.0	40.4	43.3	57.5	82.9	86.2	55.9
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0.188	0
Insecta	Diptera	Empididae	0.602	1.24	0.794	0.667	0	1.54	3.90	1.05	0.929	1.06	4.91	0.671	6.79	1.51	11.2
Insecta	Diptera	Muscidae	1.00	0	0	0.333	0	0.384	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	0	0.0481	0	0.351	0	0	0	0	0	0.377	0
Insecta	Diptera	Psychodidae	2.61	3.97	5.95	1.33	5.70	5.38	1.08	6.32	2.79	6.38	1.79	3.69	0	3.39	1.60
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0.188	0
Insecta	Diptera	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	1.61	3.23	3.17	2.00	3.07	2.69	3.04	1.05	3.72	2.13	4.91	4.53	0	0.188	0.532
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0.384	0	0	0	0	0	0	0	0	0.532
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	9.24	2.23	8.33	2.33	1.75	7.69	9.54	20.4	14.9	5.32	14.7	24.3	0	0.377	1.06
Insecta	Plecoptera	Chloroperlidae	0	0	0.397	0	0	0	0.217	0	0	1.06	0	0	0	0	0.532
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	8.03	0.993	1.59	2.33	1.32	5.38	16.7	12.3	10.5	23.4	15.2	5.37	7.14	3.39	20.2
Insecta	Plecoptera	Peltoperlidae	0.201	0.248	0	0	0.439	0.769	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	1.41	1.49	3.97	0.667	2.63	5.00	3.71	4.56	0.310	5.32	8.04	2.18	0.357	0.377	0.532
Insecta	Plecoptera	Taeniopterygidae	0.402	0	0	0	0.877	1.15	0.867	0.702	1.55	2.13	2.68	1.17	1.43	1.51	1.06
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0.744	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0.402	1.74	4.76	5.33	8.33	5.77	1.30	2.81	0.310	9.57	2.23	0	0	1.13	1.60
Insecta	Trichoptera	Rhyacophilidae	0.402	0	0	0.333	0	0.769	0	0	0	0	0	0	0.357	0.188	2.66
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	2.13	0.446	0.168	0	0.188	0

Table G.13: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon				Area-based I	Cick Samples		
					20	22		
Higher Level	Classification	Family		RG_GHFF			RG_GHNF	
			RG_GHFF-4	RG_GHFF-5	RG_GHFF-6	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	0	0	0	0.643	2.62	1.11
Clitellata	-	Enchytraeidae	0.327	0.810	1.74	1.29	0	0
Collembola	Collembola	Entomobryidae	0	0	0	0	0.581	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0.291	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0.405	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0.654	0.810	0.651	0	0.581	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	82.3	74.9	74.4	27.0	43.3	80.1
Insecta	Diptera	Dixidae	0	0	0	0	0	0
Insecta	Diptera	Empididae	4.58	5.26	7.81	7.72	6.69	0.923
Insecta	Diptera	Muscidae	0	0	0	0	0	0.185
Insecta	Diptera	Pelecorhynchidae	0	0	0	0.643	1.16	0
Insecta	Diptera	Psychodidae	0.980	2.83	2.60	1.29	7.85	1.85
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0
Insecta	 Diptera	Simuliidae	0.327	0	0	0	0	0
Insecta	 Diptera	Stratiomyidae	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0	0.405	0	0.643	2.33	0.185
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0.217	0.643	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0.405	0.651	28.9	8.43	4.67
Insecta	Plecoptera	Chloroperlidae	0	0	0	4.09	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	6.21	10.1	9.11	3.07	0.581	0.373
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0.327	0.405	0.651	21.5	11.3	10.6
Insecta	Plecoptera	Taeniopterygidae	3.92	1.62	2.17	0	0	0
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	0	1.62	0	2.57	13.9	0
Insecta	Trichoptera	Rhyacophilidae	0.327	0.405	0	0	0.317	0
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

Mary   Control   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part   Part			Taxon							Der	nsity					
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Sampropies   Recommendate   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propendition   Propen			· ·	<u> </u>		Ţ.			-			_	<u> </u>	<u> </u>	<u> </u>	,
Inscrite   Coloppeirs   Finishe   Heintimus   Hall   H17   H39   119   0   0   0   10   10   10   7   7   10   10						-							Ţ	_	-	
Freedix   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calespina   Calesp	•			<b>.</b>		_	-	_	-			_	, ,			
Insecta   Conoctor   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprinted   Supprint		· ·							_	_	-				,	
Insecta   Diplera   Centapognoriale   Probestary   0   0   0   0   0   0   0   0   0		· ·			_	-	-		-			_	, ,			•
Insecta   Diptera   Centacognophilase   Probezzia   0   0   0   0   0   0   0   0   0				· · ·							Ů,		<u> </u>			
Insecta   Diplora   Chrocoronidae   Brillis   0   0   0   0   0   0   0   0   0		· ·							-			_		<u> </u>	Ū	_
Insecta   Diplora   Chinocomidae   Structivielle   0		<u> </u>							-					<u> </u>	•	_
Insecta									-	·		_		<u> </u>	Ū	
Insecta   Diplerar Chironomidae   Dismesa   Dismesa   Diplerar Chironomidae   Eukitefiela   Dismosta   Diplerar Chironomidae   Eukitefiela   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Heltriella   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Marcopiela   Dismosta   Diplerar Chironomidae   Diplerar Chironomidae   Persona   Dismosta   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Chironomidae   Persona   Diplerar Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar Chironomidae   Diplerar							_	-	-		ŭ	-	_			_
Insocida   Diplera   Chirconomisia   Eskiefferiella   D						-			_				-			
Insectia   Dipletra   Chironomidae   Hydeniella   0   0   31   0   0   72   30   0   0   0   0   0   0   0		<u> </u>					-		-			-	<u> </u>	¥		
Insecta   Diptera Chrisnomides   Hydrobentus   0   0   0   0   0   0   0   0   0									-					¥		
Insocia   Diplotra Chironomidae   Macropleojia   Description   Diplotra Chironomidae   Macropleojia   Description   Description   Diplotra   Chironomidae   Macropleojia   Description   Description   Diplotra   Chironomidae   Macropleojia   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description   Description		<u> </u>			· · · · · ·						Ů,	-	<u> </u>	¥		·
Insecta   Dipters   Chironomidae   Macropelopia   0   0   0   0   0   0   0   0   0		<u> </u>		<b>'</b>	-				-	·		-		•		
Insecta   Diptera   Chironomiste   Microsectron   221   94   712   576   579   628   23   303   101   257   230   144   114   114   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115   115						-			_	_	_	_	, ,		- C	
Insecta   Dipleter   Chironomidae   Anacodadius   O   31   97   58   O   O   O   O   O   O   O   O   O				<u> </u>	-		-		¥ .	· ·	ŭ	-	_	•	•	-
Insecta   Diptera   Chironomidae   Orthodedius complex   37   0   32   0   0   0   0   11   10   11   0   8   16				<u> </u>								-				
Insecta   Diptera   Chronomidae   Pagasla   0   0   0   0   0   0   0   0   0		<u> </u>				_			-				Ţ	·		
Insecta   Diptera   Chironomidae   Parametrionemus   0   0   0   0   0   0   0   0   0									-							
Insecta		<u> </u>		0		-			-	-			Ţ		•	-
Insecta   Diptera   Chironomidae   Parothocladius   D   D   D   D   D   D   D   D   D						-	_			_		_	_			-
Insecta   Diptera   Chironomidae   Pentaneura   74   0   129   58   72   30   28   15   6   44   38   25							_	~	-	_	_	-	, ,		-	
Insecta   Diptera   Chironomidae   Pseutocladius   O   O   O   O   O   O   O   O   O		· ·				-						_	<u> </u>	_	-	
Insecta   Diptera   Chironomidae   Pseudodiamesa   D   D   D   D   D   D   D   D   D		<u> </u>			+	Ŭ					ļ	-				
Insecta   Diptera   Chironomidae   Rheotanytarsus   37   63   226   115   289   269   0   0   0   0   0   0   0   0   0										-			Ţ		•	-
Insecta   Diptera   Chironomidae   Stempellina   Diptera   Chironomidae   Tanylarsus   Diptera   Chironomidae   Tanylarsus   Diptera   Diptera   Chironomidae   Tanylarsus   Diptera   Diptera   Chironomidae   Tanylarsus   Diptera   Diptera   Diptera   Diptera   Dividae   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Di		<u> </u>							-	-						-
Insecta   Diptera   Chironomidae   Tanytarsus   0   0   0   0   0   0   0   0   0		· · · · · · · · · · · · · · · · · · ·		•							_	_				
Insecta   Diptera   Chironomidae   Tvetenia   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Empididae   Chelifera/Metachela   O   38   74   154   60   267   O   7   13   10   O   0   33   Insecta   Diptera   Empididae   Cincoera   O   O   O   O   O   O   O   O   O					1	-			_	-			-			_
Insecta   Diptera   Dixidae   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Dixa   Diptera   Empididae   Chelifera/Metachela   Diptera   Empididae   Chelifera/Metachela   Diptera   Empididae   Cilinocera   Diptera   Empididae   Cilinocera   Diptera   Empididae   Diptera   Empididae   Diptera   Diptera   Muscidae   Diptera   Muscidae   Diptera   Muscidae   Diptera   Muscidae   Diptera   Diptera   Pelecorhynchidae   Giutops   42   243   172   77   189   27   3   23   7   10   47   7   7   7   7   7   7   7   7				· · · · · · · · · · · · · · · · · · ·												
Insecta   Diptera   Empididae   Chelifera/Metachela   0   38   74   154   60   267   0   7   13   10   0   33     Insecta   Diptera   Empididae   Clinocera   0   0   0   0   0   0   0   0   0		· ·							-							
Insecta   Diptera   Empididae   Clinocera   O   O   O   O   O   O   O   O   O		· ·									ļ				-	
Insecta   Diptera   Muscidae   Muscidae   O   O   O   O   O   O   O   O   O		· ·									-	-			-	
Insecta   Diptera   Pelecorhynchidae   Glutops   42   243   172   77   189   27   3   23   7   10   47   7		<u> </u>													-	
Insecta   Diptera   Psychodidae   Pericoma   1,146   1,502   2,254   1,920   1,788   507   577   423   527   277   417   433     Insecta   Diptera   Simuliidae   Simuliidae   168   567   247   307   0   613   117   313   273   53   177   357     Insecta   Diptera   Tipulidae   Antocha   14   19   25   346   179   133   3   0   0   0   0   33   90     Insecta   Diptera   Tipulidae   Dicranota   14   57   49   38   0   27   70   60   87   20   47   50     Insecta   Diptera   Tipulidae   Hexatoma   0   0   0   0   0   0   0   0   0														-	-	
Insecta         Diptera         Simuliidae         Simuliidae         168         567         247         307         0         613         117         313         273         53         177         357           Insecta         Diptera         Tipulidae         Antocha         14         19         25         346         179         133         3         0         0         0         0         33         90           Insecta         Diptera         Tipulidae         Dicranota         14         57         49         38         0         27         70         60         87         20         47         50           Insecta         Diptera         Tipulidae         Hexatoma         0         0         0         0         0         0         0         0         0         0         0         0           Insecta         Diptera         Tipulidae         Limnophila         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         <			,	<del>-</del>												-
Insecta         Diptera         Tipulidae         Antocha         14         19         25         346         179         133         3         0         0         0         33         90           Insecta         Diptera         Tipulidae         Dicranota         14         57         49         38         0         27         70         60         87         20         47         50           Insecta         Diptera         Tipulidae         Hexatoma         0         0         0         0         0         0         0         0         0           Insecta         Diptera         Tipulidae         Limnophila         0         0         0         0         0         0         0         0         0           Insecta         Diptera         Tipulidae         Tipula         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td></td> <td>· ·</td> <th>· ·</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		· ·	· ·													
Insecta         Diptera         Tipulidae         Dicranota         14         57         49         38         0         27         70         60         87         20         47         50           Insecta         Diptera         Tipulidae         Hexatoma         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0		· ·							-							
Insecta         Diptera         Tipulidae         Hexatoma         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0		· ·											_	_		
Insecta         Diptera         Tipulidae         Limnophila         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <th< td=""><td></td><td><u> </u></td><th></th><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>		<u> </u>							-							
Insecta         Diptera         Tipulidae         Tipula         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 </td <td></td> <td></td> <th>· · · · · · · · · · · · · · · · · · ·</th> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td>-</td> <td></td> <td>_</td> <td>-</td> <td></td>			· · · · · · · · · · · · · · · · · · ·			-				_		-		_	-	
Insecta         Ephemeroptera         Baetidae         Baetis         84         38         74         115         179         53         60         23         13         3         20         63           Insecta         Ephemeroptera         Ephemerellidae         Ephemerellidae         0         0         0         0         43         67         7         10         7         0			· · · · · · · · · · · · · · · · · · ·			_			-	_		-		-	-	
Insecta Ephemeroptera Ephemerellidae Ephemerellidae 0 0 0 0 0 0 43 67 7 10 7 0		<u> </u>		· · · · · · · · · · · · · · · · · · ·					-							
	Insecta	Ephemeroptera														
Insecta Ephemeroptera Heptageniidae Cinygmula 14 0 0 0 0 0 23 10 0 0 0		· · · · · · · · · · · · · · · · · · ·	· ·	· · · · · · · · · · · · · · · · · · ·									·		,	
	Insecta	Ephemeroptera	Heptageniidae	Cinygmula	14	0	0	0	0	0	23	10	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon							Der	nsity					
Higher Level	Classification	Family	Lowest Practical Level			20	16					20	17		
riigilei Levei	Ciassification	1 allilly	Identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	7	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	112	19	223	77	119	27	10	3	7	43	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	28	0	0	0	60	0	0	0	0	3	0	7
Insecta	Plecoptera	Nemouridae	Malenka	531	888	798	422	715	293	67	83	40	97	103	63
Insecta	Plecoptera	Nemouridae	Zapada	671	661	322	729	596	107	683	623	650	383	357	350
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	13	0	0	0	0	27	13	7	0	0	7	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	25	0	0	27	7	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	3	0	0	0	90	0
Insecta	Trichoptera	Brachycentridae	Micrasema	14	151	74	269	656	1,467	20	20	30	30	0	257
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	56	38	420	729	596	880	0	0	0	3	40	110
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	126	19	198	38	0	0	43	30	0	10	33	13
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	38	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	233	283	247	576	467	160	77	70	217	0	77	117
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon							Der	nsity					
Higher Level	Classification	Family	Lowest Practical Level				018						)19		T.
		-	Identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	93	147	320	193	287	123	47	147	777	87	387	333
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	20	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata Clitellata	Tubificida	Naididae	Tubificinae	0	0	13	0 67	0 37	0 23	0 13	0 40	0 23	7	93	7
Collembola	- Collembola	Enchytraeidae	Enchytraeidae Collembola	0	0	0	0	0	0	0	13	0	0	93	0
Euchelicerata	Trombidiformes	- Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	3	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	27	213	40	320	73	70	13	20	43	13	80	7
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	13	0	0	20	0	10	13	20	0	0	7	7
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	13	0	0	7	3	3	13	0	0	0	7	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	20	0	3	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	7	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	17	52	35	39	0	0	8	56	0	10	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0	0	0	4	0	14	0	0	12	0
Insecta	Diptera	Chironomidae	Heleniella	34	0	141	13	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	272	288	353	26	39	86	71	169	255	50	36	105
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	4	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0	0	0	0	0	0	0	0	0	0	7
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	17	0	35	26	0	0	0	0	7	3	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	340	366	141	77	26	30	8	14	7	3	12	14
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Tanytarsus Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera Diptera	Dixidae	Dixa	0	0	0	0	0	0	7	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	40	40	20	17	3	7	13	3	0	0	13
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	27	27	107	3	7	0	27	37	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	1,333	3,947	1,267	1,987	750	307	87	427	737	60	927	87
Insecta	Diptera	Simuliidae	Simuliidae	120	227	333	7	3	27	480	1,147	267	43	587	160
Insecta	Diptera	Tipulidae	Antocha	0	0	0	13	3	17	0	0	3	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	40	53	40	13	7	3	7	40	13	3	47	33
Insecta	Diptera	Tipulidae	Hexatoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	 Tipula	0	0	0	0	0	0	20	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	173	427	227	293	70	93	720	2,653	1,350	220	1,200	1,033
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon							Der	nsity					-
Higher Level	Classification	Family	Lowest Practical Level			20	18					20	119		
riigilei Levei	Ciassification	1 annly	Identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	13	3	13	13	7	10	73	40	53	17	87	20
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	67	147	27	313	120	127	100	267	37	27	73	27
Insecta	Plecoptera	Nemouridae	Zapada	1,720	2,227	1,347	1,100	430	383	853	1,400	293	40	940	160
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	3	0	0	0	0	0	0	7	0	13	7
Insecta	Plecoptera	Perlodidae	Skwala	13	13	0	0	0	3	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	13	27	13	33	30	180	27	40	17	3	73	153
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	27	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	3	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	10	33	7	0	10	0	0	7
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	80	267	53	40	110	37	67	93	37	3	0	67
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	7	0	0	0	0	7
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	387	413	440	153	90	107	253	867	163	33	187	67
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	7
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon							Dei	nsity					
Higher Level	l Classification	Family	Lowest Practical Level					)20						)21	-
	T	-	Identification		GH_GH1_AS-2		RG_GHBP-2		RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4
Bivalvia	Veneroida	Pisidiidae	Pisidium	3,653	2,133	1,200	373	1,947	2,307	2,947	500	3,204	624	2,436	1,440
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida Tubificida	Naididae Naididae	Nais bretscheri	613 187	693 0	0	0	0	13	0	0	0	0	0	0
Clitellata Clitellata	Tubilicida	Naididae	Nais communis Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubilicida	Enchytraeidae	Enchytraeidae	800	160	40	10	53	27	53	17	12	54	12	36
Collembola	Collembola	-	Collembola	0	0	13	0	0	0	0	0	0	6	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	53	107	53	20	93	53	40	3	60	12	24	24
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	13	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	373	907	0	0	0	0	0	7	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	24
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	53	13	27	13	13	3	60	24	12	12
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	13	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	12	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	18	0	12
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	18	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	22	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura  Diamesa	0	0	41	32	65	19 0	55 0	0	0	27 0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae Chironomidae	Eukiefferiella	33	0	0 20	0	0	0	0	0	0	14	108	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	458	360	265	53	195	427	589	65	0	14	36	108
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	0	19	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	98	60	0	21	0	19	18	0	0	96	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	11	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	480	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	4	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	327	60	20	11	65	37	92	13	24	41	0	0
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera Diptera	Chironomidae	Tanytarsus Tvetenia	98	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera	Chironomidae Dixidae	Dixa	0	0	0	0	27	0	0	0	0	6	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	27	160	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	7	0	0	0	7	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	27	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	27	27	27	3	48	84	3	3
Insecta	Diptera	Psychodidae	Pericoma	133	53	880	517	1,560	2,053	840	517	864	1,560	288	924
Insecta	Diptera	Simuliidae	Simuliidae	880	853	53	67	53	27	93	13	0	48	96	72
Insecta	Diptera	Tipulidae	Antocha	0	53	0	0	13	0	0	10	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	240	320	0	13	27	13	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Hexatoma	4	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	80	53	133	230	293	307	200	260	0	6	24	24
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon							Der	sity					-
Higher Level	Classification	Family	Lowest Practical Level				20	20		-			20	21	
Higher Lever	Ciassification	Faililly	Identification	GH_GH1_AS-1	GH_GH1_AS-2	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	13	0	0	0	13	0	12	0	0	12
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	13	23	27	53	27	0	12	6	36	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	13	3	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	17	10	32	14	15	5	396	282	591	511
Insecta	Plecoptera	Nemouridae	Zapada	240	107	530	977	341	466	452	88	240	1,137	693	1,457
Insecta	Plecoptera	Perlodidae	Isoperla	27	0	0	3	0	0	0	10	0	6	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	53	53	40	53	147	240	173	460	84	84	84	180
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	1,840	2,187	0	0	0	0	0	3	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0	0	13	7	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	53	267	160	37	187	240	320	27	12	24	72	12
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	13	0	0	0	12	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	107	230	347	213	533	27	144	312	267	651
Malacostraca	Amphipoda	Gammaridae	Gammarus	987	1,013	7	0	27	17	27	27	132	15	36	72
Malacostraca	Amphipoda	Hyalellidae	Hyalella	160	427	0	0	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon					Der	nsity			
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHBP-5	21 RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	20 RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	3,804	3,588	744	432	624	792	402	123
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	339	84	6	18	84	96	0	12
Collembola	Collembola	-	Collembola	0	0	6	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	72	36	12	0	24	12	18	18
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	6	9
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	3
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	6	3
Insecta	Coleoptera	Elmidae	Heterlimnius	24	0	6	6	24	36	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	12	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	12	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	19	0	8	0	15	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	8	9	31	14	7	0
Insecta	Diptera	Chironomidae	Heleniella	19	0	0	0	15	14	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	8	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	9	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	457	90	16	99	139	101	58	9
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	0	0	0	6
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	18	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	57	0	16	9	15	0	7	0
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	32	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	8	0	0	14	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	24	12	6	0	0	0	6	3
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	72	12	0	0	48	42	12	0
Insecta	Diptera	Psychodidae	Pericoma	6,168	912	246	708	1,092	2,856	588	186
		Simuliidae	Simuliidae	108		246		228	516		
Insecta	Diptera				24		186			72	87
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	45
Insecta	Diptera	Tipulidae	Dicranota	12	0	6	18	60	72	6	3
Insecta	Diptera	Tipulidae	Hexatoma	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	72	12	402	192	552	360	414	228
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0

Table G.14: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2016 to 2022

		Taxon					Der	sity			
Higher I aval	Classification	Family	Lowest Practical Level	20	)21			20	122		
nigher Level	Ciassification	railily	Identification	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	6	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	120	0	18	12	36	96	12	3
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	24	6	0
Insecta	Plecoptera	Nemouridae	Malenka	1,130	192	105	30	72	108	36	40
Insecta	Plecoptera	Nemouridae	Zapada	1,925	588	543	222	288	216	42	14
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	36	6	36	48	0	3
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	360	516	12	12	24	0	60	276
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	3
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	180	60	0	0	0	0	0	3
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	1,035	240	240	225	471	588	60	39
Malacostraca	Amphipoda	Gammaridae	Gammarus	210	78	6	12	0	15	18	0
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three	-minute Kick Sa	ımples					
			Lawart Branting Lawal	2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level	Classification	Family	Lowest Practical Level Identification	RG GHCKD	RG GHCKD	RG_GHCKD	GREE1-50	RG GHCKD	RG GHCKD	RG GHCKD		RG_GHCKD			RG_GHCKD	
			identification	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Bivalvia	Veneroida	Pisidiidae	Pisidiidae	0.0483	0	5.11	0	17.8	16.2	7.31	15.9	19.0	23.2	18.3	17.6	24.1
Bivalvia	Veneroida	Pisidiidae	Pisidium	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	0	0	0	0	0	0.826	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais	0.532	2.79	0.189	0	1.20	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	12.3	0	0	0	0	0.771	0.935	0.587	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	3.41	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	Hypogastruridae	0	0	0	0	0	0	0	0.257	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0.189	0	0	0	0	0.257	0.312	0.293	0.631	0.309	0.487
Euchelicerata	Trombidiformes	Aturidae	Aturidae	0	0	1.03	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	Feltria	0	1.24	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Protzia	0	0	0	0	0	0	0.292	0	0	0	0	0	0.649
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.0725	0.310	1.44	0	1.51	1.03	0.292	0.257	0.312	2.64	0.946	1.54	1.30
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0.0725	0	0	0	0	0.344	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Promenetus	0	0	0	0	0	0	0	0	0	0	0	0.309	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0.275	0	0.257	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0	0	0	0.877	0.257	0	0	0.315	0.309	0.487
Insecta	Coleoptera	Elmidae Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Optioservus Staphylinidae	0.0483	0	0.379 0	0	0.301	0	0	0	0	0	0	0	0
Insecta Insecta	Coleoptera Diptera	Ceratopogonidae	Bezzia/ Palpomyia	0.0463	0	0.189	0	0.301	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0.169	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Mallochohelea	0.0483	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0.0483	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	2.63	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0.337	0.565	0	0	0	0	1.51	0	2.51
Insecta	Diptera	Chironomidae	Diamesa	0	0.964	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0.532	0.964	0.201	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0.504	0.401	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Labrundinia	0	0.964	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0.449	0
Insecta	Diptera	Chironomidae	Micropsectra	13.3	0.321	17.3	0	6.41	9.32	0	0.720	2.08	1.23	0.505	3.59	27.7
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	1.20	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0.643	0	0	0	0.565	0	0	0.692	0.411	0	0.449	0
Insecta	Diptera	Chironomidae	Pagastia .	0	0.321	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	1.69	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0.0967	0	0	0	0	0.565	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0.643	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0	0	2.01	0	0	0	0	0	0	0	0.505	0	0
Insecta	Diptera	Chironomidae	Procladius	0	0	0.401	0	0	0	0	0	0	0	0	0	0
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Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three	-minute Kick Sa	ımples					
			Lowest Practical Level	2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level	Classification	Family	Identification	RG_GHCKD	RG_GHCKD	RG_GHCKD	GREE1-50	RG_GHCKD	RG_GHCKD	RG_GHCKD		RG_GHCKD			RG_GHCKD	
			identification .	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	11.9	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	6.22	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0.201	0	0	0	0	2.16	2.77	1.64	0	0	0
Insecta	Diptera	Chironomidae	Thienemannimyia group	0.0967	0.321	5.42	0	0	0.282	0	0	0.692	0.821	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0.201	0	0	0	0	0.720	0	0	0	0.449	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.193	4.02	1.70	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0.312	0	0	0.309	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0.189	0	0	1.10	0	0	0	0	0.631	0	0
Insecta	Diptera	Psychodidae	Pericoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	3.04	23.5	8.33	0	26.8	19.3	14.6	8.23	19.3	32.3	30.3	31.5	0
Insecta	Diptera	Simuliidae	Simuliidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	77.1	13.0	8.71	0	0.602	3.31	12.6	3.60	2.49	0.293	9.15	4.32	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0.293	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0.483	0.619	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0.290	2.17	0.568	0	0.452	0	0	0	0	0	0.315	0.309	0
Insecta	Diptera	Tipulidae	Hexatoma	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0.310	0.568	0	0.452	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0.379	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0.310	5.30	0	2.71	28.4	7.31	0.771	0.623	0.293	8.20	12.0	17.0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0.379	0	0	0	0	0.257	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	1.17	0.257	0	0	0	0	0.243
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0.514	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0.193	0	0.379	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0.292	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0.0483	1.24	2.65	0	0.602	0.826	0.585	0.257	0.623	0.587	0.663	1.27	1.22
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0.189	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Amphinemura	0	0	1.23	0	0	0	0	0	0	0	1.66	3.49	3.41
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	10.8	1.23	2.49	24.3	12.4	8.76	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada	0 705	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0.725	6.50	1.23	0	8.49	4.00	31.4	19.9	26.2	11.5	8.62	5.71	5.60
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0.310 0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0					0.292	0	_	0	0.663	0	
Insecta	Plecoptera	Perlodidae	Kogotus		-	0	0	0	0		-	0	0		0.635	0.973
Insecta	Plecoptera	Perlodidae	Megarcys Skwala	0	0.310	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae				-				-	-		-	0	0	0
Insecta	Plecoptera	Pteronarcyidae	Pteronarcella	0	0	0	0	0	0	0 0.292	0 771	0	0	1 22	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0 0483	0	0	0	0	2.73		0.771	0	1.47	1.33	0	0.243
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0.0483	0.619	2.99	0	1.45		0 1.49	0 2.35				-	0.292
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0.619	2.99	0		0	0	2.35	1.56 0	3.38	0	0.383	0.292
Insecta	Trichoptera	Hydropsychidae	Arctopsyche		-	-		0		-		-	-			
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0.338 0.435	0	0 0.249	0	0	0	0 0.893	0 0.293	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0.435	U	0.249	U	Į U	l 0	0.693	0.293	U	U	0	U	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Three	-minute Kick Sa	mples					
			Lowest Practical Level	2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level	Classification	Family	Identification	RG_GHCKD	RG_GHCKD	RG_GHCKD	GREE1-50	RG_GHCKD	RG_GHCKD	RG_GHCKD		RG_GHCKD			RG_GHCKD	
			lacitation	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	0.298	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	1.74	0	5.78	0.911	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0.929	0	0	8.67	4.56	2.68	0.293	0.312	1.84	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0.0483	0	0.249	0	0	0	0.595	0.879	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0.0483	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0.242	9.91	2.24	0	1.45	1.21	3.57	4.98	4.67	3.99	5.22	1.91	3.80
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna grou	0.870	14.6	1.99	0	2.53	2.43	7.14	7.92	3.12	3.69	8.00	7.27	9.05
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0.348	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	1.06	0	0.631	0	0	0	0.877	2.57	1.56	0.880	2.21	5.86	0.973
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0.310	0.316	0	0	0	0	0.257	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

1		Taxon							Area-based	Kick Samples					
			Lowest Practical Level				016						017		
Higher Level (	Classification	Family	Identification			RG_	GHBP					RG_	GHBP		
	T			RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Pisidiidae	Pisidium	8.58	5.49	2.98	4.58	11.5	2.88	2.96	1.95	1.82	8.16	20.7	4.37
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0.583	0	0
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	2.44	11.8	11.1	11.9	0	0	0	1.17	2.56	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	5.15	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	1.59	0.305	1.63	0	0	4.53	0	0	0	0.583	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0.636	11.3	11.4	11.4	21.6	34.8	1.25	12.2	17.3	1.36	7.67	22.3
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	Feltria	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Protzia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	1.78	3.36	3.53	4.20	2.40	2.38	2.65	2.46	0.649	5.05	1.02	2.45
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0.445	0	0	0	0	0.297	0	0	0	0	0	0.213
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0.259	0	0	0	0.426
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Promenetus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	3.18	1.89	1.66	1.91	0	0	0	0.389	0.390	1.17	0.256	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0.623	0	0	0	0	0.213
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0.318	0	0.308	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Mallochohelea	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.838	0.509	0.355	0	0	0	3.72	0.982	1.75	0.762	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0.219	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0	0	0	0.231	0	0	0	0	0	0.527
Insecta	Diptera	Chironomidae	Heleniella	0	0.509	0	0	0.584	0.231	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0.355	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Labrundinia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0.254	0	0
Insecta	Diptera	Chironomidae	Micropsectra	5.03	1.53	7.80	5.73	4.67	4.84	1.06	11.8	3.94	15.0	8.82	4.61
Insecta	Diptera	Chironomidae	Nanocladius	0	0.509	1.06	0.573	0	0	0	0	0	0.254	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0.838	0	0.355	0	0	0	0.531	0.393	0.438	0	0.294	0.527
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0.531	0.196	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	1.68	0	1.42	0.573	0.584	0.231	1.33	0.589	0.219	2.54	1.47	0.791
Insecta	Diptera	Chironomidae	Procladius	0	0	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-based	Kick Samples					
			Lowest Practical Level				016					20	017		
Higher Level	Classification	Family	Identification			RG_	GHBP					RG_	GHBP		
			lacitimeation	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0.219	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0.838	1.02	2.48	1.15	2.34	2.08	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0.264
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	7.62	1.18	1.05
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0.509	0	0	0	0	0	0.196	0.219	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0.156	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0.611	0.814	1.53	0.481	2.06	0	0.259	0.519	0.583	0	1.06
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0.954	3.93	1.88	0.763	1.52	0.206	0.156	0.908	0.260	0.583	1.79	0.213
Insecta	Diptera	Psychodidae	Pericoma	26.1	24.3	24.7	19.1	14.4	3.91	26.9	16.5	20.5	16.1	16.0	13.8
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	3.81	9.16	2.71	3.05	0	4.73	5.45	12.2	10.6	3.11	6.78	11.4
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0.318	0.305	0.271	3.44	1.44	1.03	0.156	0	0	0	1.28	2.88
Insecta	Diptera	Tipulidae	Dicranota	0.318	0.916	0.543	0.382	0	0.206	3.27	2.33	3.38	1.17	1.79	1.60
Insecta	Diptera	Tipulidae	Hexatoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0.156	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	1.91	0.611	0.814	1.15	1.44	0.412	2.80	0.908	0.519	0.194	0.767	2.02
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	2.02	2.59	0.260	0.583	0.256	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0.318	0	0	0	0	0	1.09	0.389	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0.256	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	2.54	0.305	2.44	0.763	0.962	0.206	0.467	0.130	0.260	2.52	0	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0.636	0	0	0	0.481	0	0	0	0	0.194	0	0.213
Insecta	Plecoptera	Nemouridae	Amphinemura	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	12.1	14.3	8.75	4.20	5.77	2.26	3.12	3.24	1.56	5.63	3.96	2.02
Insecta	Plecoptera	Nemouridae	Zapada	15.3	10.7	3.53	7.25	4.81	0.823	31.9	24.2	25.3	22.3	13.7	11.2
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0.303	0	0	0	0	0.206	0.623	0.259	0	0	0.256	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Pteronarcyidae	Pteronarcella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0.271	0	0	0.206	0.312	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0.271	0	0	0.200	0.156	0	0	0	3.45	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0.318	2.44	0.814	2.67	5.29	11.3	0.130	0.778	1.17	1.75	0	8.20
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0.318	0	0.814	0	0	0	0.933	0.778	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
เมอซิปิเส	пынорина	riyuropayoniuae	riyuropsycriidae	U	U	U	U	U	U	L U	U	U	U	U	U

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-based	Kick Samples					
			Lowest Practical Level			20	)16					20	)17		
Higher Level	Classification	Family	Identification			RG_	GHBP					RG_0	GHBP		
			identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	1.27	0.611	4.61	7.25	4.81	6.79	0	0	0	0.194	1.53	3.51
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	2.86	0.305	2.17	0.382	0	0	2.02	1.17	0	0.583	1.28	0.426
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0.382	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae R	hyacophila brunnea/vemna grou	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	5.30	4.58	2.71	5.73	3.77	1.23	3.58	2.72	8.44	0	2.94	3.73
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-based	Kick Samples					
			Lowest Practical Level				18						19		
Higher Level	Classification	Family	Identification			RG_0	SHBP					RG_0	GHBP		
			idominioación	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Pisidiidae	Pisidium	1.94	1.65	6.52	3.93	13.5	7.30	1.61	1.95	18.7	13.8	8.11	14.3
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0.407	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0.272	1.36	1.73	1.38	0.459	0.533	0.563	1.06	1.96	0.286
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0.178	0	0	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	Feltria	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Protzia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0.532	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.554	2.40	0.815	6.50	3.46	4.14	0.459	0.266	1.05	2.13	1.68	0.286
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0.277	0	0	0.407	0	0.592	0.459	0.266	0	0	0.140	0.286
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Promenetus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0.277	0	0	0.136	0.157	0.197	0.459	0	0	0	0.140	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0.407	0	0.197	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0.229	0	0	Ü	0	0
Insecta	Diptera	Ceratopogonidae	Mallochohelea	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	-	0.589	0.720	-	0		0.271	0.750	-		0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.353			0.784	-	0			0	1.60		
Insecta	Diptera	Chironomidae Chironomidae	Diamesa  Eukiefferiella	0	0	0	0	0	0.222	0	0 0.187	0	0	0 0.252	0
Insecta	Diptera	Chironomidae	Euκιeπeriella Heleniella	0.706	0	2.88	0.261	0	0.222	0	0.187	0	0	0.252	0
Insecta Insecta	Diptera Diptera	Chironomidae	Hydrobaenus	0.706	0	0	0.261	0	0	0	0	0	0	0	0
_	Diptera		Labrundinia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Diptera	Chironomidae Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0.301
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0.301
Insecta	Diptera	Chironomidae	Micropsectra	5.65	3.24	7.20	0.523	1.86	5.10	2.44	2.25	6.16	7.98	0.755	4.51
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0.323	0.206	0	0	0	0.10	0	0.755	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0.200	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0	0	0	0	0	0	0	0	0	0	0.301
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0.301
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0.353	0	0.720	0.523	0	0	0	0	0.179	0.532	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0.555	0	0.720	0.323	0	0	0	0	0.179	0.332	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	7.06	4.12	2.88	1.57	1.24	1.78	0.271	0.187	0.179	0.532	0.252	0.602
Insecta	Diptera	Chironomidae	Procladius	0	0	0	0	0	0	0.271	0.187	0.179	0.552	0.252	0.002
motold	Dipleia	Gillionoffilae	Frociaulus	U	U	U	U	U	U		U	U	U	U	U

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-based	Kick Samples					
			Lowest Practical Level			20	18					20	19		
Higher Level	l Classification	Family	Identification			RG_0	SHBP					RG_0	SHBP		
			identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0.229	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0.450	0.815	0.407	0.786	0.197	0.229	0.178	0.0805	0	0	0.571
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0.300	0.543	2.17	0.157	0.394	0	0.355	0.885	0	0	0
Insecta	Diptera	Psychodidae	Pericoma	27.7	44.4	25.8	40.4	35.4	18.1	2.98	5.68	17.8	9.57	19.4	3.71
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	2.49	2.55	6.79	0.136	0.157	1.58	16.5	15.3	6.44	6.91	12.3	6.86
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0.271	0.157	0.986	0	0	0.0805	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	0.831	0.600	0.815	0.271	0.314	0.197	0.229	0.533	0.322	0.532	0.979	1.43
Insecta	Diptera	Tipulidae	Hexatoma	0	0.000	0.010	0.27 1	0	0	0	0.000	0	0.002	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0.688	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	3.60	4.80	4.62	5.96	3.30	5.52	24.8	35.4	32.6	35.1	25.2	44.3
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0.00	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0.277	0.0375	0.272	0.271	0.314	0.592	2.52	0.533	1.29	2.66	1.82	0.857
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0.277	0.0373	0.272	0.271	0.514	0.392	0	0.555	0	0	0	0.837
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Amphinemura	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	1.39	1.65	0.543	6.37	5.66	7.50	3.44	3.55	0.885	4.26	1.54	1.14
Insecta	Plecoptera	Nemouridae	Zapada	35.7	25.1	27.4	22.4	20.3	22.7	29.4	18.6	7.08	6.38	19.7	6.86
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0.38	0	0.80
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Periodidae	Megarcys	0	0.0375	0	0	0	0	0	0	0.161	0	0.280	0.286
Insecta	Plecoptera	Periodidae	Skwala	0.277	0.0375	0	0	0	0.197	0	0	0.161	0	0.260	0.266
Insecta	Plecoptera	Pteriodidae	Pteronarcella	0.277	0.150	0	0	0	0.197	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
		Brachycentridae		0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae Brachycentridae	Brachycentrus Micrasema	0.277	0.300	0.272	0.678	1.42	10.6	0.917	0.533	0.402	0.532	1.54	6.57
Insecta	Trichoptera	Hydropsychidae		0.277	0.300	0.272	0.678	0	0	0.917	0.533	0.402	0.532	0	0.57
Insecta	Trichoptera	Hydropsychidae Hydropsychidae	Arctopsyche	0.554	0	0	0	0	0	0	0	0.0805	0	0	_
Insecta	Trichoptera	, , ,	Cheumatopsyche			-	0	0					_		0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	U	U	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon		•	•			•	Area-based h	(ick Samples		•	•	•	
			Lowest Practical Level			20	)18					20	19		
Higher Level	Classification	Family	Identification			RG_0	GHBP					RG_0	SHBP		
			identification	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0.472	1.97	0.229	0	0.241	0	0	0.286
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	1.66	3.00	1.09	0.813	5.19	2.17	2.29	1.24	0.885	0.532	0	2.86
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0.229	0	0	0	0	0.286
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna grou	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	8.03	4.65	8.97	3.12	4.25	6.31	8.72	11.6	3.94	5.32	3.92	2.86
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0	0	0	0	0	0	0	0	0	0.286
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-base	d Kick Samples					
			Lowest Practical Level				2	2020					20	21	
Higher Level	l Classification	Family	Identification		H1_AS			RG	_GHBP				RG_0	GHBP	
			identification	GH_GH1_AS-1	GH_GH1_AS	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4
Bivalvia	Veneroida	Pisidiidae	Pisidiidae	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Pisidiidae	Pisidium	31.9	20.3	32.8	13.8	34.9	34.8	44.7	24.0	60.4	13.9	50.3	25.8
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	5.36	6.60	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	1.63	0	0	0	0	0.201	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	6.99	1.52	1.09	0.369	0.957	0.402	0.810	0.800	0.226	1.20	0.248	0.646
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0.364	0	0	0	0	0	0	0.133	0	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	Feltria	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Protzia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0.466	1.02	1.46	0.738	1.67	0.804	0.607	0.160	1.13	0.267	0.496	0.431
Euchelicerata	Trombidiformes	Neoacaridae	Neoacaridae	0	0	0	0	0	0.201	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	3.26	8.63	0	0	0	0	0	0.320	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0.431
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Promenetus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	1.46	0.492	0.478	0.201	0.202	0.160	1.13	0.533	0.248	0.215
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0	0	0	0	0	0.201	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia/ Palpomyia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0.248	0
Insecta	Diptera	Ceratopogonidae	Mallochohelea	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0	0	0	0	0	0	0.400	0	0.215
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0.280	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0.389	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	1.11	1.17	1.17	0.280	0.839	0.208	0	0.610	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0.286	0	0.557	0	0	0	0	0	0	0.305	2.23	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Labrundinia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Micropsectra	4.00	3.43	7.24	1.95	3.50	6.44	8.95	3.12	0	0.305	0.743	1.94
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	0	0.280	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0.857	0.571	0	0.779	0	0.280	0.280	0	0	2.13	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0.390	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	4.57	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0.208	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	2.86	0.571	0.557	0.390	1.17	0.560	1.40	0.624	0.452	0.914	0	0
Insecta	Diptera	Chironomidae	Procladius	0	0	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-base	d Kick Samples					
			Lowest Practical Level				:	2020						)21	
Higher Leve	l Classification	Family	Identification	GH_G	H1_AS			RG_	_GHBP				RG_C	GHBP	
			identification	GH_GH1_AS-1	GH_GH1_AS	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0.857	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0.478	0	0	0	0	0.133	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.233	1.52	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0.246	0	0	0	0.320	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0.233	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	0	0	0	0.478	0.402	0.405	0.160	0.905	1.87	0.0620	0.0538
Insecta	Diptera	Psychodidae	Pericoma	1.17	0.508	24.0	19.1	28.0	31.0	12.8	24.8	16.3	34.7	5.95	16.6
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	7.69	8.12	1.46	2.46	0.957	0.402	1.42	0.640	0	1.07	1.98	1.29
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0.508	0	0	0.239	0	0	0.480	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	2.09	3.05	0	0.492	0.478	0.201	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Hexatoma	0.0327	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0.699	0.508	3.64	8.49	5.26	4.63	3.04	12.5	0	0.133	0.496	0.431
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0.364	0	0	0	0.202	0	0.226	0	0	0.215
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0	0	0.364	0.861	0.478	0.804	0.405	0	0.226	0.133	0.743	0
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0.202	0.160	0	0	0	0
Insecta	Plecoptera	Nemouridae	Amphinemura	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0.467	0.373	0.582	0.213	0.229	0.236	7.47	6.27	12.2	9.16
Insecta	Plecoptera	Nemouridae	Zapada	2.10	1.02	14.5	36.0	6.12	7.03	6.86	4.24	4.52	25.3	14.3	26.1
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0.233	0	0	0.123	0	0	0	0.480	0	0.133	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Pteronarcyidae	Pteronarcella	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0.466	0.508	1.09	1.97	2.63	3.62	2.63	22.1	1.58	1.87	1.73	3.23
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	16.1	20.8	0	0	0	0	0	0.160	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Area-base	d Kick Samples					
			Lowest Practical Level				2	2020					20	)21	
Higher Level	Classification	Family	Identification	GH_G	H1_AS			RG_	_GHBP				RG_0	GHBP	
			identification	GH_GH1_AS-1	GH_GH1_AS	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0	0	0.202	0.320	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	0.466	2.54	4.37	1.35	3.35	3.62	4.86	1.28	0.226	0.533	1.49	0.215
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0.202	0	0	0	0.248	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna grou	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	0	0	2.91	8.49	6.22	3.22	8.10	1.28	2.71	6.93	5.51	11.7
Malacostraca	Amphipoda	Gammaridae	Gammarus	8.62	9.64	0.182	0	0.478	0.251	0.405	1.28	2.49	0.333	0.743	1.29
Malacostraca	Amphipoda	Hyalellidae	Hyalella	1.40	4.06	0	0	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon				Aı	rea-based Kick	Samples			
			Lowest Practical Level	-	21				)22		
Higher Level	Classification	Family	Identification		GHBP			RG_0	GHBP		
				RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	Pisidiidae	0	0	0	0	0	0	0	0
Bivalvia	Veneroida	Pisidiidae	Pisidium	23.4	55.5	27.1	19.6	16.1	13.2	21.9	11.0
Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Chaetogaster	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais bretscheri	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Nais communis	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	2.09	1.30	0.219	0.816	2.17	1.59	0	1.08
Clitellata	-	Enchytraeidae	Enchytraeus	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	Hypogastruridae	0	0	0	0	0	0	0	0
Collembola	Collembola	-	Collembola	0	0	0.219	0	0	0	0	0
Euchelicerata	Sarcoptiformes	_	Oribatida	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	Aturidae	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	Feltria	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Protzia	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	Wandesia	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia			0.438	0	0.619	0.199	0.980	-
	Trombidiformes			0.444	0.557	0.438	0				1.61
Euchelicerata		Neoacaridae	Neoacaridae	0	0	-		0	0	0	-
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	0	0	0	0.327	0.806
Euchelicerata	Trombidiformes	Torrenticolidae	Torrenticolidae	0	0	0	0	0	0	0	0.269
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	0	0	0	0	0	0.327	0.269
Gastropoda	Basommatophora	Planorbidae	Promenetus	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0.148	0	0.219	0.272	0.619	0.598	0	0
Insecta	Coleoptera	Elmidae	Narpus	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	Staphylinidae	0.0739	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia/ Palpomyia	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Mallochohelea	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0.0739	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Brundiniella	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0.117	0	0.292	0	0.398	0	0	0
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	0	0.292	0.408	0.795	0.239	0.392	0
Insecta	Diptera	Chironomidae	Heleniella	0.117	0	0.232	0.400	0.798	0.239	0.332	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0.117	0	0.292	0	0.330	0.255	0	0
Insecta	Diptera	0	· · · · · · · · · · · · · · · · · · ·	0	0	0.292	0	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Labrundinia Limnophyes	0	0	0	0	0	0	0	0
	· · · · · · · · · · · · · · · · · · ·	Chironomidae		0	0	0	0.408	0	0	0	0
Insecta	Diptera	Chironomidae	Macropelopia								
Insecta	Diptera		Micropsectra	2.81	1.39	0.584	4.49	3.58	1.67	3.14	0.806
Insecta	Diptera	Chironomidae	Nanocladius	0	0	0	0	0	0	0	0.538
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0.279	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pentaneura	0.352	0	0.584	0.408	0.398	0	0.392	0
	Diptera	Chironomidae	Procladius	0	0	0	0	0	0	0	0

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon				Aı	rea-based Kicl	•			
			Lowest Practical Level		21				)22		
Higher Leve	el Classification	Family	Identification	_	SHBP				GHBP		
				RG_GHBP-5	RG_GHBP-6	_	RG_GHBP-2	_	_	_	_
Insecta	Diptera	Chironomidae	Psectrocladius	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	1.17	0	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemannimyia group	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	0.292	0	0	0.239	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0.148	0.186	0.219	0	0	0	0.327	0.269
Insecta	Diptera	Empididae	Clinocera	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	0	0	0	0	0	0	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0.444	0.186	0	0	1.24	0.698	0.654	0
Insecta	Diptera	Psychodidae	Pericoma	38.0	14.1	8.97	32.1	28.1	47.4	32.0	16.7
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simuliidae	0.665	0.371	8.97	8.44	5.88	8.57	3.92	7.80
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	Stratiomyidae	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Antocha	0	0	0	0	0	0	0	4.03
Insecta	Diptera	Tipulidae	Dicranota	0.0739	0	0.219	0.816	1.55	1.20	0.327	0.269
Insecta	Diptera	Tipulidae	Hexatoma	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Limnophila	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	Tipula	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis	0.444	0.186	14.7	8.71	14.2	5.98	22.6	20.4
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Cinygmula	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0.219	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Paracapnia	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	Chloroperlidae	0.739	0	0.656	0.544	0.928	1.59	0.654	0.269
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0.399	0.327	0
Insecta	Plecoptera	Nemouridae	Amphinemura	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	6.96	2.97	3.81	1.34	1.86	1.79	1.96	3.55
Insecta	Plecoptera	Nemouridae	Zapada	11.9	9.10	19.8	10.1	7.42	3.59	2.29	1.29
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	1.31	0.272	0.928	0.797	0	0.269
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Pteronarcyidae	Pteronarcella	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Brachycentrus	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	2.22	7.99	0.438	0.544	0.619	0	3.27	24.7
Insecta	Trichoptera	Hydropsychidae	Arctopsyche	0	0	0.100	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	0	0	0	0	0	0	0	0.269
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0	0	0	0	0.200

Table G.15: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon				Aı	ea-based Kick	Samples			
			Lowest Practical Level	20	21			20	)22		
Higher Level	Classification	Family	Identification	RG_0	GHBP			RG_	GHBP		
			identification	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptilidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostomatidae	1.11	0.929	0	0	0	0	0	0.269
Insecta	Trichoptera	Limnephilidae	Ecclisomyia	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna grou	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophilidae	6.38	3.71	8.75	10.2	12.1	9.77	3.27	3.49
Malacostraca	Amphipoda	Gammaridae	Gammarus	1.29	1.21	0.219	0.544	0	0.249	0.980	0
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	0	0	0	0	0	0	0

Table G.16: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon							Der	nsity					
					20	)16					20	)17		
Higher Level	Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	377	340	272	461	1,430	373	63	50	47	140	540	137
Clitellata	Tubificida	Naididae	70	19	841	1,190	1,371	2,133	0	0	0	40	67	0
Clitellata	-	Enchytraeidae	28	699	1,039	1,152	2,682	4,507	27	313	443	23	200	697
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	78	208	322	422	298	308	57	63	17	87	27	77
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	20	0	0	0	0	39	0	0	0	0	0	7
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	7	0	0	0	13
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	140	117	152	192	0	0	13	10	10	20	7	7
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	14	0	28	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	405	283	1,261	806	1,013	987	153	363	180	453	307	243
Insecta	Diptera	Dixidae	0	0	0	0	0	0	3	0	0	0	0	0
Insecta	Diptera	Empididae	0	38	74	154	60	267	0	7	13	10	0	33
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	42	243	172	77	189	27	3	23	7	10	47	7
Insecta	Diptera	Psychodidae	1,146	1,502	2,254	1,920	1,788	507	577	423	527	277	417	433
Insecta	Diptera	Simuliidae	168	567	247	307	0	613	117	313	273	53	177	357
Insecta	Diptera	Tipulidae	28	76	74	384	179	160	77	60	87	20	80	140
Insecta	Ephemeroptera	Baetidae	84	38	74	115	179	53	60	23	13	3	20	63
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	43	67	7	10	7	0
Insecta	Ephemeroptera	Heptageniidae	14	0	0	0	0	0	23	10	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0	0	0	0	0	7	0
Insecta	Plecoptera	Chloroperlidae	112	19	223	77	119	27	10	3	7	43	0	0
Insecta	Plecoptera	Leuctridae	28	0	0	0	60	0	0	0	0	3	0	7
Insecta	Plecoptera	Nemouridae	1,202	1,549	1,120	1,152	1,311	400	750	707	690	480	460	413
Insecta	Plecoptera	Perlodidae	13	0	0	0	0	27	13	7	0	0	7	0
Insecta	Plecoptera	Taeniopterygidae	0	0	25	0	0	27	7	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	14	151	74	269	656	1,467	23	20	30	30	90	257
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	56	38	420	729	596	880	0	0	0	3	40	110
Insecta	Trichoptera	Lepidostomatidae	126	19	198	38	0	0	43	30	0	10	33	13
Insecta	Trichoptera	Limnephilidae	0	0	0	38	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	233	283	247	576	467	160	77	70	217	0	77	117
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.16: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon							Dei	nsity					
					20	118					20	)19		
Higher Leve	l Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	93	147	320	193	287	123	47	147	777	87	387	333
Clitellata	Tubificida	Naididae	0	0	0	20	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	13	67	37	23	13	40	23	7	93	7
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	3	0	0
Euchelicerata	Trombidiformes	Lebertiidae	27	213	40	320	73	70	13	20	43	13	80	7
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	13	0	0	20	0	10	13	20	0	0	7	7
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	13	0	0	27	3	7	13	0	0	0	7	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	7	0	0	0	0	0
Insecta	Diptera	Chironomidae	680	707	707	180	70	120	87	253	270	67	60	133
Insecta	Diptera	Dixidae	0	0	0	0	0	0	7	0	0	0	0	0
Insecta	Diptera	Empididae	0	40	40	20	17	3	7	13	3	0	0	13
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	27	27	107	3	7	0	27	37	0	0	0
Insecta	Diptera	Psychodidae	1,333	3,947	1,267	1,987	750	307	87	427	737	60	927	87
Insecta	Diptera	Simuliidae	120	227	333	7	3	27	480	1,147	267	43	587	160
Insecta	Diptera	Tipulidae	40	53	40	27	10	20	27	40	17	3	47	33
Insecta	Ephemeroptera	Baetidae	173	427	227	293	70	93	720	2,653	1,350	220	1,200	1,033
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	13	3	13	13	7	10	73	40	53	17	87	20
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	1,787	2,373	1,373	1,413	550	510	953	1,667	330	67	1,013	187
Insecta	Plecoptera	Perlodidae	13	17	0	0	0	3	0	0	7	0	13	7
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	13	27	13	33	30	180	27	40	17	3	73	153
Insecta	Trichoptera	Hydropsychidae	27	0	0	0	0	0	0	0	3	0	0	0
Insecta	Trichoptera	Hydroptilidae	0	0	0	0	10	33	7	0	10	0	0	7
Insecta	Trichoptera	Lepidostomatidae	80	267	53	40	110	37	67	93	37	3	0	67
Insecta	Trichoptera	Limnephilidae	0	0	0	0	0	0	7	0	0	0	0	7
Insecta	Trichoptera	Rhyacophilidae	387	413	440	153	90	107	253	867	163	33	187	67
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	7
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0
=	-	Collembola	0	0	0	0	0	0	0	13	0	0	0	0

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.16: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon								Der	nsity						
						20	)20						20	)21		
Higher Level	Classification	Family	GH_GH1_AS-1	GH_GH1_AS-2	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	3,653	2,133	1,200	373	1,947	2,307	2,947	500	3,204	624	2,436	1,440	3,804	3,588
Clitellata	Tubificida	Naididae	800	693	0	0	0	13	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	800	160	40	10	53	27	53	17	12	54	12	36	339	84
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	53	107	53	20	93	53	40	3	60	12	24	24	72	36
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	13	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	373	907	0	0	0	0	0	7	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	24	0	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	53	13	27	13	13	3	60	24	12	12	24	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	13	0	0	0	0	0	0	12	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0	0	0	18	12	12	12	0
Insecta	Diptera	Chironomidae	1,013	960	347	127	347	520	773	87	24	192	144	108	552	108
Insecta	Diptera	Dixidae	0	0	0	0	27	0	0	0	0	6	0	0	0	0
Insecta	Diptera	Empididae	27	160	0	7	0	0	0	7	0	0	0	0	24	12
Insecta	Diptera	Muscidae	27	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	27	27	27	3	48	84	3	3	72	12
Insecta	Diptera	Psychodidae	133	53	880	517	1,560	2,053	840	517	864	1,560	288	924	6,168	912
Insecta	Diptera	Simuliidae	880	853	53	67	53	27	93	13	0	48	96	72	108	24
Insecta	Diptera	Tipulidae	243	373	0	13	40	13	0	10	0	0	0	0	12	0
Insecta	Ephemeroptera	Baetidae	80	53	133	230	293	307	200	260	0	6	24	24	72	12
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	13	0	0	0	13	0	12	0	0	12	0	0
Insecta	Plecoptera	Chloroperlidae	0	0	13	23	27	53	27	0	12	6	36	0	120	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	13	3	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	240	107	547	987	373	480	467	93	636	1,419	1,284	1,968	3,054	780
Insecta	Plecoptera	Perlodidae	27	0	0	3	0	0	0	10	0	6	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	53	53	40	53	147	240	173	460	84	84	84	180	360	516
Insecta	Trichoptera	Hydropsychidae	1,840	2,187	0	0	0	0	0	3	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	0	0	0	0	0	0	13	7	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	53	267	160	37	187	240	320	27	12	24	72	12	180	60
Insecta	Trichoptera	Limnephilidae	0	0	0	0	0	0	13	0	0	0	12	0	0	0
Insecta	Trichoptera	Rhyacophilidae	0	0	107	230	347	213	533	27	144	312	267	651	1,035	240
Malacostraca	Amphipoda	Gammaridae	987	1,013	7	0	27	17	27	27	132	15	36	72	210	78
Malacostraca	Amphipoda	Hyalellidae	160	427	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	13	0	0	0	0	0	0	6	0	0	0	0

Notes: No./m²= number of organisms per square metre; - = not applicable.

Table G.16: Density (No./m²) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Family Level of Taxonomy, 2016 to 2022

	Taxon				Der	nsity		
						122		
Higher Level	Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	744	432	624	792	123	402
Clitellata	Tubificida	Naididae	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	6	18	84	96	12	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	12	0	24	12	18	18
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	9	6
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	3	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	3	6
Insecta	Coleoptera	Elmidae	6	6	24	36	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	96	126	216	144	15	72
Insecta	Diptera	Dixidae	0	0	0	0	0	0
Insecta	Diptera	Empididae	6	0	0	0	3	6
Insecta	Diptera	Muscidae	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	48	42	0	12
Insecta	Diptera	Psychodidae	246	708	1,092	2,856	186	588
Insecta	Diptera	Simuliidae	246	186	228	516	87	72
Insecta	Diptera	Tipulidae	6	18	60	72	48	6
Insecta	Ephemeroptera	Baetidae	402	192	552	360	228	414
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	6	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	18	12	36	96	3	12
Insecta	Plecoptera	Leuctridae	0	0	0	24	0	6
Insecta	Plecoptera	Nemouridae	648	252	360	324	54	78
Insecta	Plecoptera	Perlodidae	36	6	36	48	3	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	12	12	24	0	276	60
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	3	0
Insecta	Trichoptera	Hydroptilidae	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	3	0
Insecta	Trichoptera	Limnephilidae	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	240	225	471	588	39	60
Malacostraca	Amphipoda	Gammaridae	6	12	0	15	0	18
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0
-	-	Collembola	6	0	0	0	0	0

Notes: No./ $m^2$ = number of organisms per square metre; - = not applicable.

Table G.17: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on Family Level of Taxonomy, 2012 to 2022

	Taxon							Three	e-minute Kick Sa	mples					
			2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level (	Classification	Family	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Bivalvia	Veneroida	Pisidiidae	0.0483	0	5.11	2.67	17.8	16.2	7.31	15.9	19.0	23.2	18.3	17.6	24.1
Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	0.826	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0.532	2.79	12.5	3.47	1.20	0	0	0.771	0.935	0.587	0	0	0
Clitellata	-	Enchytraeidae	0	0	3.41	2.13	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0	0	0.257	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0.189	0	0	0	0	0.257	0.312	0.293	0.631	0.309	0.487
Euchelicerata	Trombidiformes	Aturidae	0	0	1.03	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	0	1.24	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0.292	0	0	0	0	0	0.649
Euchelicerata	Trombidiformes	Lebertiidae	0.0725	0.310	1.44	0	1.51	1.03	0.292	0.257	0.312	2.64	0.946	1.54	1.30
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0.0725	0	0	0	0	0.344	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0.309	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0.275	0	0.257	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0.379	1.07	0	0	0.877	0.257	0	0	0.315	0.309	0.487
Insecta	Coleoptera	Staphylinidae	0.0483	0	0	0	0.301	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0.0483	0	0.189	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	14.0	17.0	33.5	5.60	8.43	11.3	2.63	3.60	6.23	4.11	2.52	4.94	30.2
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Empididae	0.193	4.02	1.70	0.533	0	0	0	0	0.312	0	0	0.309	0
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0.189	0.533	0	1.10	0	0	0	0	0.631	0	0
Insecta	Diptera	Psychodidae	3.04	23.5	8.33	44.0	26.8	19.3	14.6	8.23	19.3	32.3	30.3	31.5	0
Insecta	Diptera	Simuliidae	77.1	13.0	8.71	2.40	0.602	3.31	12.6	3.60	2.49	0.293	9.15	4.32	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0.293	0	0	0
Insecta	Diptera	Tipulidae	0.773	3.10	1.14	0.800	0.904	0	0	0	0	0	0.315	0.309	0
Insecta	Ephemeroptera	Ameletidae	0	0	0.379	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	0.310	5.30	5.33	2.71	28.4	7.31	0.771	0.623	0.293	8.20	12.0	17.0
Insecta	Ephemeroptera	Ephemerellidae	0	0	0.379	0	0	0	1.17	0.514	0	0	0	0	0.243
Insecta	Ephemeroptera	Heptageniidae	0.193	0	0.379	0.267	0	0	0	0.514	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0	0.292	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	0.0483	1.24	2.65	0.800	0.602	0.826	0.585	0.257	0.623	0.587	0.663	1.27	1.22
Insecta	Plecoptera	Leuctridae	0	0	0.189	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	0.725	6.50	2.46	19.7	19.3	5.23	33.9	44.2	38.6	20.2	10.3	9.21	9.00
Insecta	Plecoptera	Peltoperlidae	0	0.310	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	0.310	0	0	0	0	0.292	0	0	0	0.663	0.635	0.973
Insecta	Plecoptera	Pteronarcyidae	0	0	0	0.267	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0.292	0.771	0	1.47	1.33	0	0.243
Insecta	Trichoptera	Brachycentridae	0.0483	0.619	2.99	0.800	1.45	2.73	1.49	2.35	1.56	3.38	0	0.383	0.292
Insecta	Trichoptera	Hydropsychidae	0.773	0	0.249	0.267	0	0	1.19	0.293	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	0	0	1.74	0	5.78	0.911	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0.929	0	0	8.67	4.56	2.68	0.293	0.312	1.84	0	0	0
Insecta	Trichoptera	Limnephilidae	0.0483	0	0.249	4.27	0	0	0.595	0.879	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0.0483	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	1.11	24.5	4.24	5.07	3.98	3.64	10.7	12.9	7.79	7.68	13.6	9.19	12.8
Malacostraca	Amphipoda	Gammaridae	1.06	0	0.631	0	0	0	0.877	2.57	1.56	0.880	2.21	5.86	0.973
Malacostraca	Amphipoda	Hyalellidae	0	0.310	0.316	0	0	0	0	0.257	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.17: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on Family Level of Taxonomy, 2012 to 2022

	Taxon							Area-based	Kick Samples					
					20	016					20	017		
Higher Level	Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	8.58	5.49	2.98	4.58	11.5	2.88	2.96	1.95	1.82	8.16	20.7	4.37
Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	1.59	0.305	9.22	11.8	11.1	16.5	0	0	0	2.33	2.56	0
Clitellata	-	Enchytraeidae	0.636	11.3	11.4	11.4	21.6	34.8	1.25	12.2	17.3	1.36	7.67	22.3
Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	1.78	3.36	3.53	4.20	2.40	2.38	2.65	2.46	0.649	5.05	1.02	2.45
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0.445	0	0	0	0	0.297	0	0	0	0	0	0.213
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0.259	0	0	0	0.426
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	3.18	1.89	1.66	1.91	0	0	0.623	0.389	0.390	1.17	0.256	0.213
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0.318	0	0.308	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	9.22	4.58	13.8	8.02	8.17	7.61	7.17	14.1	7.01	26.4	11.8	7.77
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0.156	0	0	0	0	0
Insecta	Diptera	Empididae	0	0.611	0.814	1.53	0.481	2.06	0	0.259	0.519	0.583	0	1.06
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0.954	3.93	1.88	0.763	1.52	0.206	0.156	0.908	0.260	0.583	1.79	0.213
Insecta	Diptera	Psychodidae	26.1	24.3	24.7	19.1	14.4	3.91	26.9	16.5	20.5	16.1	16.0	13.8
Insecta	Diptera	Simuliidae	3.81	9.16	2.71	3.05	0	4.73	5.45	12.2	10.6	3.11	6.78	11.4
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0.636	1.22	0.814	3.82	1.44	1.23	3.58	2.33	3.38	1.17	3.07	4.47
Insecta	Ephemeroptera	Ameletidae	0.000	0	0.014	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	1.91	0.611	0.814	1.15	1.44	0.412	2.80	0.908	0.519	0.194	0.767	2.02
Insecta	Ephemeroptera	Ephemerellidae	0	0.011	0.014	0	0	0.412	2.02	2.59	0.260	0.583	0.256	0
Insecta	Ephemeroptera	Heptageniidae	0.318	0	0	0	0	0	1.09	0.389	0.200	0.303	0.230	0
Insecta	Plecoptera	Capniidae	0.516	0	0	0	0	0	0	0.303	0	0	0.256	0
Insecta	Plecoptera	Chloroperlidae	2.54	0.305	2.44	0.763	0.962	0.206	0.467	0.130	0.260	2.52	0.230	0
Insecta	Plecoptera	Leuctridae	0.636	0.303	0	0.703	0.481	0.200	0.407	0.130	0.200	0.194	0	0.213
Insecta	Plecoptera	Nemouridae	27.3	25.0	12.3	11.4	10.6	3.09	35.0	27.5	26.9	28.0	17.6	13.2
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0.303	0	0	0	0	0.206	0.623	0.259	0	0	0.256	0
Insecta	Plecoptera	Pteronarcyidae	0.303	0	0	0	0	0.200	0.023	0.239	0	0	0.230	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0.271	0	0	0.206	0.312	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0.318	2.44	0.814	2.67	5.29	11.3	1.09	0.778	1.17	1.75	3.45	8.20
Insecta	Trichoptera	Hydropsychidae	0.318	0	0.814	0	0	0	0	0.778	0	0	0	0.20
Insecta	Trichoptera	, , ,	1.27	0.611	4.61	7.25	4.81	6.79	0	0	0	0.194	1.53	3.51
	Trichoptera	Hydroptilidae Lepidostomatidae	2.86	0.305	2.17	0.382	0	0	2.02	1.17	0	0.194	1.28	0.426
Insecta	· · · · · · · · · · · · · · · · · · ·	Limnephilidae	0	0.305	0	0.382	0	0	0	0	0	0.565	0	0.426
Insecta	Trichoptera		0		0	+	0			0		0	0	
Insecta	Trichoptera	Phryganeidae		0		0 5.72		0	0		0	-		0
Insecta	Trichoptera	Rhyacophilidae	5.30	4.58	2.71	5.73	3.77	1.23	3.58	2.72	8.44	0	2.94	3.73
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0

Table G.17: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on Family Level of Taxonomy, 2012 to 2022

	Taxon							Area-based	Kick Samples					
	0				20	)18					20	)19		
Higher Level	Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	1.94	1.65	6.52	3.93	13.5	7.30	1.61	1.95	18.7	13.8	8.11	14.3
Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0.407	0	0	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0.272	1.36	1.73	1.38	0.459	0.533	0.563	1.06	1.96	0.286
Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0.532	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0.554	2.40	0.815	6.50	3.46	4.14	0.459	0.266	1.05	2.13	1.68	0.286
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0.277	0	0	0.407	0	0.592	0.459	0.266	0	0	0.140	0.286
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0.277	0	0	0.542	0.157	0.394	0.459	0	0	0	0.140	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0	0.229	0	0	0	0	0
Insecta	Diptera	Chironomidae	14.1	7.95	14.4	3.66	3.30	7.10	2.98	3.37	6.52	10.6	1.26	5.71
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0.229	0	0	0	0	0
Insecta	Diptera	Empididae	0	0.450	0.815	0.407	0.786	0.197	0.229	0.178	0.0805	0	0	0.571
Insecta	Diptera	Muscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0.300	0.543	2.17	0.157	0.394	0	0.355	0.885	0	0	0
Insecta	Diptera	Psychodidae	27.7	44.4	25.8	40.4	35.4	18.1	2.98	5.68	17.8	9.57	19.4	3.71
Insecta	Diptera	Simuliidae	2.49	2.55	6.79	0.136	0.157	1.58	16.5	15.3	6.44	6.91	12.3	6.86
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0.831	0.600	0.815	0.542	0.472	1.18	0.917	0.533	0.402	0.532	0.979	1.43
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0.517	0.000	0.402	0	0.070	0
Insecta	Ephemeroptera	Baetidae	3.60	4.80	4.62	5.96	3.30	5.52	24.8	35.4	32.6	35.1	25.2	44.3
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	0.277	0.0375	0.272	0.271	0.314	0.592	2.52	0.533	1.29	2.66	1.82	0.857
Insecta	Plecoptera	Leuctridae	0.211	0.0373	0.272	0.271	0.314	0.392	0	0.333	0	0	0	0.837
Insecta	Plecoptera	Nemouridae	37.1	26.7	28.0	28.7	25.9	30.2	32.8	22.2	7.96	10.6	21.3	8.00
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0.277	0.188	0	0	0	0.197	0	0	0.161	0	0.280	0.286
Insecta	Plecoptera	Pteronarcyidae	0.211	0.166	0	0	0	0.197	0	0	0.101	0	0.280	0.280
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0.277	0.300	0.272	0.678	1.42	10.6	0.917	0.533	0.402	0.532	1.54	6.57
Insecta	Trichoptera	·	0.554	0.300	0.272	0.676	0	0	0.917	0.533	0.402	0.532	0	0.57
	Trichoptera	Hydropsychidae	0.554	0	0	0	0.472	1.97	0.229	0	0.0805	0	0	0.286
Insecta	Trichoptera	Hydroptilidae Lepidostomatidae	1.66	3.00	1.09	0.813	5.19	2.17	2.29	1.24	0.241	0.532	0	2.86
Insecta		•	+	0			0					0.532		
Insecta	Trichoptera	Limnephilidae	0		0	0	0	0	0.229	0	0	0	0	0.286
Insecta	Trichoptera	Phryganeidae		0				0	0		0			0
Insecta	Trichoptera	Rhyacophilidae	8.03	4.65	8.97	3.12	4.25	6.31	8.72	11.6	3.94	5.32	3.92	2.86
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0.286
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0.178	0	0	0	0

Table G.17: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on Family Level of Taxonomy, 2012 to 2022

Devices   Presidence   1518   223   22.6   13.8   34.9   44.7   24.0   60.4   13.9   50.3   25.8   22.4		Taxon								Area-based Kic	k Samples						
Description   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provided   Provid	Higher Level C	lassification	Family				2020							20	)21		
Description   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company	Higher Level C	iassilication	railily	GH_GH1_AS-1	GH_GH1_AS	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Cimilation	Bivalvia	Veneroida	Pisidiidae	31.9	20.3	32.8	13.8	34.9	34.8	44.7	24.0	60.4	13.9	50.3	25.8	23.4	55.5
Colimbida	Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collembols   Hypopashumine   0   0   0   0   0   0   0   0   0	Clitellata	Tubificida	Naididae	6.99	6.60	0	0	0	0.201	0	0	0	0	0	0	0	0
Furtheticrons   Marches   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Promission   Pro	Clitellata	-	Enchytraeidae	6.99	1.52	1.09	0.369	0.957	0.402	0.810	0.800	0.226	1.20	0.248	0.646	2.09	1.30
Establisherate   Tromisformers   Annaton   0   0   0   0   0   0   0   0   0	Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Excheliserata   Transidiformes   Feintafe   0   0   0   0   0   0   0   0   0	Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Eucheliorate   Euch	Euchelicerata	Trombidiformes	Aturidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicental Euchelicental Commissions   Lebertiage   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   Commissions   C	Euchelicerata	Trombidiformes	Feltriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucheliscinate   Tomodelformes   Speritomidiscip   20	Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicental   Transhidformer   Especification   Superinormalises   Department   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhidformer   Transhi	Euchelicerata	Trombidiformes	Lebertiidae	0.466	1.02	1.46	0.738	1.67	0.804	0.607	0.160	1.13	0.267	0.496	0.431	0.444	0.557
Euchelisticate   Transchiliderine   Transchiliderine   Transchiliderine   Planschilider   O   O   O   O   O   O   O   O   O	Euchelicerata					0	0	0	0.201	0	0	0	0	0	0	0	0
Euchelisticate   Transchiliderine   Transchiliderine   Transchiliderine   Planschilider   O   O   O   O   O   O   O   O   O	Euchelicerata	Trombidiformes	Sperchontidae	3.26	8.63	0	0	0	0	0	0.320	0	0	0	0	0	0
Gastopode   Bacomatophora   Planothidae   0   0   0   0   0   0   0   0   0						0	0	0	0	0		0	0		0.431	0	0
Insertia   Colespetera   Curcularinidae   Colespetera   Elimine   Colespetera   Elimine   Colespetera   Elimine   Colespetera   Elimine   Colespetera   Elimine   Colespetera   Elimine   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespetera   Colespeter						0		0	0	0	0	0	0				0
Insecta   Colocoptera   Elmislate   0		•			<u>-</u>	Ţ	-	0			0	0	0			-	0
Insecta		•			-	-	-	·	-	_	·		~		_	-	0
Insecta   Diptern   Ceratopogonidae   O   O   O   O   O   O   O   O   O		<u> </u>					+										0
Insecta   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Dipt					_	Ţ		_		_			_				0
Insecta   Diptern   Dixidae   Diptern   Dixidae   Diptern   Empiridae   Diptern   Empiridae   Diptern   Empiridae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Musicidae   Diptern   Pelecori/punhidae   Diptern   Pelecori/punhidae   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Psychodione   Diptern   Diptern   Diptern   Sirationny/diae   Diptern   Sirationny/diae   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern   Diptern					9.14	9.47		_	_		4.16						1.67
Insecta   Diptera   Empiridate   0.233   1.52   0   0.246   0   0   0   0.320   0   0   0   0   0.488   0		•															0
Insecta   Diplora   Muscidade   0.233   0   0   0   0   0   0   0   0   0				The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	-	Ţ					ŭ .			-		_	0.186
Insecta   Diptera   Pelecotrynchidae   0   0   0   0   0   0   0   0   0		•				Ţ						, ,	~		-		0
Insecta   Diptera   Psychodidae   1.17   0.508   24.0   19.1   28.0   31.0   12.8   24.8   16.3   34.7   5.95   16.6   38.0   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00   1.00					•	Ţ		-		ŭ	ŭ .	_	· ·	-	_	_	0.186
Insecta   Diptera   Simulidae   7.69   8.12   1.46   2.46   0.957   0.402   1.42   0.640   0   1.07   1.98   1.29   0.665   0   0   0   0   0   0   0   0   0		•				ŭ											14.1
Insecta   Diptera   Stratomyldae   Diptera   Tipulidae   Diptera   Tipulidae   Diptera   Tipulidae   Diptera   Diptera   Tipulidae   Diptera   Diptera   Tipulidae   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera			•														0.371
Insecta   Diptera   Tipulidae   2.13   3.85   0   0.492   0.718   0.201   0   0.480   0   0   0   0   0   0   0   0   0		•															0
Insecta   Ephemeroptera   Ameletidae   0   0   0   0   0   0   0   0   0		•	,		-	-		_	_		_	Ť	-	-		-	0
Insecta   Ephemeroptera   Baetidae   0.699   0.508   3.64   8.49   5.26   4.63   3.04   12.5   0   0.133   0.496   0.431   0.444   0			·									Ţ	~		_		0
Insecta   Ephemeroptera   Ephemeroptera   Ephemeroptera   Ephemeroptera   Ephemeroptera   Heptageniidae   0   0   0   0   0   0   0   0   0						-		-		-	ŭ .		· ·	-	_	_	0.186
Insecta   Ephemeroptera   Heptageniidae   0   0   0   0   0   0   0   0   0																	0
Insecta   Plecoptera   Capniidae   O   O   O   O   O   O   O   O   O			· · · · · · · · · · · · · · · · · · ·				-	ļ			· · · · · · · · · · · · · · · · · · ·		<u> </u>	-			0
Insecta   Plecoptera   Chloroperiidae   O   O   O   O   O   O   O   O   O		· · · · · · · · · · · · · · · · · · ·			-	~		-	-	_	•		· ·		_	_	0
Insecta   Plecoptera   Leuctridae   D		<u> </u>		-	-			-	-				-	-		_	0
Insecta   Plecoptera   Nemouridae   2.10   1.02   14.9   36.4   6.70   7.24   7.09   4.48   12.0   31.5   26.5   35.3   18.8   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6   18.6		<u> </u>			_						-				_		0
Insecta   Plecoptera   Peltoperidae   O   O   O   O   O   O   O   O   O					_	-		_	_				-		-	-	12.1
Insecta   Plecoptera   Perlodidae   0.233   0   0   0.123   0   0   0   0.480   0   0.133   0   0   0   0   0																	0
Insecta   Plecoptera   Pteronarcyidae   O   O   O   O   O   O   O   O   O					<u>-</u>		_	ļ			ŭ .	Ţ	-			<u> </u>	0
Insecta   Plecoptera   Taeniopterygidae   0   0   0   0   0   0   0   0   0					-												0
Insecta   Trichoptera   Brachycentridae   0.466   0.508   1.09   1.97   2.63   3.62   2.63   22.1   1.58   1.87   1.73   3.23   2.22   7																	0
Insecta   Trichoptera   Hydropsychidae   16.1   20.8   0   0   0   0   0   0   0   0   0								_			_		-				7.99
Insecta   Trichoptera   Hydroptilidae   0   0   0   0   0   0   0   0   0			· ·														0
Insecta         Trichoptera         Lepidostomatidae         0.466         2.54         4.37         1.35         3.35         3.62         4.86         1.28         0.226         0.533         1.49         0.215         1.11         0           Insecta         Trichoptera         Limnephilidae         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0<																	0
Insecta         Trichoptera         Limnephilidae         0         0         0         0         0         0         0.202         0         0         0.248         0         0           Insecta         Trichoptera         Phryganeidae         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 </td <td></td> <td></td> <th></th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.929</td>																	0.929
Insecta         Trichoptera         Phryganeidae         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0			•														0.929
Insecta         Trichoptera         Rhyacophilidae         0         0         2.91         8.49         6.22         3.22         8.10         1.28         2.71         6.93         5.51         11.7         6.38         3.22           Malacostraca         Amphipoda         Gammaridae         8.62         9.64         0.182         0         0.478         0.251         0.405         1.28         2.49         0.333         0.743         1.29         1.29           Malacostraca         Amphipoda         Hyalellidae         1.40         4.06         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0																	0
Malacostraca         Amphipoda         Gammaridae         8.62         9.64         0.182         0         0.478         0.251         0.405         1.28         2.49         0.333         0.743         1.29         1.29           Malacostraca         Amphipoda         Hyalellidae         1.40         4.06         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <td< td=""><td></td><td></td><th></th><td></td><td>-</td><td></td><td></td><td>-</td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td>-</td><td>3.71</td></td<>					-			-			-					-	3.71
Malacostraca         Amphipoda         Hyalellidae         1.40         4.06         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0																	1.21
- Collembola 0 0 0.364 0 0 0 0 0 0 0 0.333 0 0 0																	0

Table G.17: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on Family Level of Taxonomy, 2012 to 2022

	Taxon				Area-based I	Cick Samples		
	<b>A.</b> 10 11				20	22		
Higher Level	Classification	Family	RG_GHBP-1	RG_GHBP-2	RG_GHBP-3	RG_GHBP-4	RG_GHBP-5	RG_GHBP-6
Bivalvia	Veneroida	Pisidiidae	27.1	19.6	16.1	13.2	21.9	11.0
Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0
Clitellata	-	Enchytraeidae	0.219	0.816	2.17	1.59	0	1.08
Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Aturidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0.438	0	0.619	0.199	0.980	1.61
Euchelicerata	Trombidiformes	Neoacaridae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	0	0.327	0.806
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0.027	0.269
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0.327	0.269
Insecta	Coleoptera	Curculionidae	0	0	0	0	0.327	0.209
Insecta	Coleoptera	Elmidae	0.219	0.272	0.619	0.598	0	0
Insecta	Coleoptera	Staphylinidae	0.219	0.272	0.019	0.596	0	0
	Diptera	Ceratopogonidae	0	0	0	0	0	0
Insecta	'		3.50	5.71	5.57	2.39	3.92	1.34
Insecta	Diptera	Chironomidae						
Insecta	Diptera	Dixidae	0	0	0	0	0	0
Insecta	Diptera	Empididae	0.219	0	0	0	0.327	0.269
Insecta	Diptera	Muscidae	0	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	1.24	0.698	0.654	0
Insecta	Diptera	Psychodidae	8.97	32.1	28.1	47.4	32.0	16.7
Insecta	Diptera	Simuliidae	8.97	8.44	5.88	8.57	3.92	7.80
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	0.219	0.816	1.55	1.20	0.327	4.30
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	14.7	8.71	14.2	5.98	22.6	20.4
Insecta	Ephemeroptera	Ephemerellidae	0	0	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	0.219	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	0.656	0.544	0.928	1.59	0.654	0.269
Insecta	Plecoptera	Leuctridae	0	0	0	0.399	0.327	0
Insecta	Plecoptera	Nemouridae	23.6	11.4	9.28	5.38	4.25	4.84
Insecta	Plecoptera	Peltoperlidae	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	1.31	0.272	0.928	0.797	0	0.269
Insecta	Plecoptera	Pteronarcyidae	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0.438	0.544	0.619	0	3.27	24.7
Insecta	Trichoptera	Hydropsychidae	0	0	0	0	0	0.269
Insecta	Trichoptera	Hydroptilidae	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0.269
Insecta	Trichoptera	Limnephilidae	0	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	8.75	10.2	12.1	9.77	3.27	3.49
Malacostraca	Amphipoda	Gammaridae	0.219	0.544	0	0.249	0.980	0
Malacostraca	Amphipoda	Hyalellidae	0	0	0	0	0	0
-	-	Collembola	0.219	0	0	0	0	0

Table G.18: Comparison of Benthic Invertebrate Community Endpoints Among Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas of Greenhills Creek, 2016 to 2022

			P-values	3			M	`T				-	rea Contras	ts						Temporal	Contrasts	}		
Endpoint	Transformation	Year x	Year	Area	Year		MC	<i>,</i> I			Letter C	Contrasts			MOD (%) ^a		RG_0	GHBP	RG	_GHUT	RG_	_GHNF	RG_	_GHFF
		Area	i eai	Alea		RG_GHBP	RG_GHUT	RG_GHFF	RG_GHNF	RG_GHBP	RG_GHUT	RG_GHNF	RG_GHFF	RG_GHUT	RG_GHNF	RG_GHFF	Letter	MOD (%) b	Letter	MOD (%) b	Letter	MOD (%) b	Letter	MOD (%) b
					2016	8,587	2,638	1,956	1,822	Α	В	В	В	-2.8	-3.7	-3.5	Α	baseline	AB	baseline	BC	baseline	AB	baseline
					2017	2,414	2,930	810	812	Α	Α	В	В	0.94	-5.3	-5.3	В	-3.0	AB	0.20	С	-1.2	В	-1.9
Density (No.					2018	3,933	5,522	1,809	3,134	AB	Α	AB	В	0.55	-0.37	-1.3	AB	-1.9	Α	1.4	AB	0.83	AB	-0.16
organisms/m²)	log ₁₀	0.008	<0.001	<0.001	2019	2,928	3,654	1,550	3,212	Α	Α	Α	Α	0.26	0.11	-0.74	AB	-2.6	AB	0.63	AB	0.87	AB	-0.49
,				-	2020	4,139	7,769	3,799	2,053	AB	A	В	AB	1.3	-1.4	-0.18	AB	-1.7	A	2.1	BC	0.18	A	1.4
				-	2021	6,382	6,644	2,380	7,670	A AB	A AB	A	B B	0.085 -0.85	0.39	-2.1 -1.2	AB B	-0.70	A B	1.8 -1.0	A	1.2	AB	0.41
					2022	2,572 6.70	1,560 1.19	1,250 1.11	3,867 1.10	AB	B	B	В	-0.85	0.69 -9.2	-9.2	AB	-2.9 baseline	С	baseline	AB ABC	baseline	AB AB	-0.94 baseline
					2017	2.87	1.13	0.891	0.634	A	AB	C	BC	-1.0	-3.8	-3.0	В	-4.3	ABC	0.64	C	-1.4	В	-0.57
T					2018	3.55	3.63	1.97	1.35	A	A	В	AB	0.037	-1.6	-0.96	В	-3.2	AB	1.5	ABC	0.51	AB	1.5
Total Biomass	log ₁₀	0.004	<0.001	<0.001	2019	2.96	1.43	0.799	0.951	A	AB	В	В	-0.75	-1.2	-1.3	В	-4.2	BC	0.24	BC	-0.38	В	-0.86
(g/m²)					2020	4.11	4.57	3.20	1.74	AB	Α	В	AB	0.22	-1.8	-0.52	AB	-2.5	Α	1.8	ABC	1.2	Α	2.8
					2021	11.6	4.12	1.31	2.98	Α	В	BC	С	-2.8	-3.6	-5.8	Α	2.8	AB	1.6	Α	2.6	AB	0.45
					2022	3.37	0.978	1.00	2.49	Α	С	AB	BC	-1.5	-0.37	-1.5	В	-3.5	С	-0.26	AB	2.1	В	-0.26
				_	2016	25.5	18.7	19.0	20.0	Α	В	В	В	-2.0	-1.6	-1.9	AB	baseline	BC	baseline	Α	baseline	AB	baseline
				-	2017	25.7	23.5	20.0	16.8	A	AB	С	BC	-1.2	-4.7	-3.0	A	0.048	A	1.5	AB	-1.1	AB	0.32
LPL Richness		<0.001	0.000	z0.004	2018	21.7	15.7	20.2	15.2	A	В	В	A	-2.6 -1.4	-2.8	-0.64	ABC	-1.1	C	-0.96	В	-1.6	AB	0.38
LPL RICHHESS	none	<b>\0.001</b>	0.002	<0.001	2019	21.0 22.7	17.3 19.8	19.3 22.2	18.7 17.8	A	A AB	A B	A	-1.4	-0.92 -2.5	-0.66 -0.25	ABC ABC	-1.3 -0.82	BC ABC	-0.42 0.37	AB AB	-0.45 -0.73	AB A	0.11 1.0
				-	2020	19.2	20.5	15.5	20.5	A AB	Ab	A	В	0.36	0.36	-0.25	C	-1.8	ABC	0.57	Ab	0.17	B	-1.1
					2022	20.8	18.0	21.2	17.2	A	A	A	A	-1.2	-1.5	0.14	BC	-1.4	BC	-0.21	AB	-0.96	A	0.70
					2016	19.0	11.8	13.0	12.3	A	В	В	В	-3.6	-3.3	-3.0	A	baseline	A	baseline	A	baseline	A	baseline
					2017	18.8	13.0	13.2	10.8	Α	В	В	В	-4.0	-5.4	-3.8	Α	-0.083	Α	1.00	Α	-0.69	Α	0.100
					2018	16.7	8.50	14.2	9.17	Α	В	В	Α	-5.0	-4.6	-1.5	Α	-1.2	В	-2.9	Α	-1.5	Α	0.70
Family Richness	none	0.041	0.028	<0.001	2019	17.2	10.2	12.8	11.0	Α	В	В	В	-3.0	-2.7	-1.9	Α	-0.92	AB	-1.4	Α	-0.62	Α	-0.100
					2020	18.0	10.8	14.2	11.2	Α	С	С	В	-3.6	-3.4	-1.9	Α	-0.50	AB	-0.86	Α	-0.54	Α	0.70
					2021	16.7	13.0	11.7	10.8	Α	В	В	В	-1.6	-2.6	-2.2	Α	-1.2	Α	1.00	Α	-0.69	Α	-0.80
					2022	16.5	11.0	14.8	10.8	Α	В	В	Α	-2.9	-3.0	-0.89	Α	-1.2	AB	-0.71	Α	-0.69	Α	1.1
				-	2016	30.0	29.5	10.3	32.3	A	A	A	В	-0.072	0.36	-5.0	В	baseline	A	baseline	BC	baseline	D	baseline
				-	2017	35.6	22.9	19.2	65.3	В	BC	A	C	-2.3	3.2	-3.3	AB	0.80	ABC	-0.72	A	2.6	ABC	3.1
%EPT	log ₁₀	<0.001	0.002	<0.001	2018 2019	45.0 60.3	18.6 12.6	34.5 26.5	31.3 25.1	A	B C	A B	A B	-5.6 -9.1	-2.3 -5.1	-1.7 -4.8	AB A	1.9 3.3	ABC C	-1.3 -2.4	BC C	-0.12 -0.92	A AB	5.9 4.6
70LF 1	10910	<b>\0.001</b>	0.002	V0.001	2020	31.9	15.8	30.1	47.1	A	B	A	A	-1.9	1.1	-0.16	В	0.29	BC	-1.8	AB	1.4	AB	5.3
					2021	31.5	15.3	12.4	36.6	A	В	A	В	-1.8	0.38	-2.4	В	0.23	BC	-1.9	ABC	0.46	CD	0.90
					2022	37.3	18.4	17.2	28.6	A	BC	AB	C	-2.3	-0.87	-2.6	AB	1.0	ABC	-1.4	BC	-0.45	BCD	2.5
					2016	0.979	0	0.149	0	Α	В	В	В	-1.6	-1.6	-1.3	ВС	baseline	Α	_ c	AB	- c	С	baseline
					2017	1.52	0	1.38	0.510	Α	В	В	Α	-1.4	-0.92	-0.13	AB	0.88	Α	_ c	Α	_ c	Α	5.6
					2018	4.71	0	1.10	0	Α	С	С	В	-3.3	-3.3	-2.5	AB	6.1	Α	_ c	В	_ c	AB	4.3
%Ephemeroptera	rank	<0.001	<0.001	<0.001	2019	33.8	0	0.301	0	Α	В	В	В	-4.5	-4.5	-4.4	Α	53	Α	_ c	AB	_ c	ВС	0.69
					2020	4.94	0	1.95	0	Α	В	В	Α	-2.1	-2.1	-1.3	AB	6.4	Α	_ c	AB	- °	Α	8.1
					2021	0.308	0	0	0	Α	AB	В	AB	-1.3	-1.3	-1.3	С	-1.1	Α	_ c	В	_ c	С	-0.67
					2022	14.6	0	0.752	0	Α	С	C	В	-1.7	-1.7	-1.6	A	22	Α	_ c	В	_ c	ABC	2.7
					2016	13.6	26.3	7.03	31.6	В	A	A	C	0.88	1.1	-0.88	BCD	baseline	A	baseline	<u>B</u>	baseline	D	baseline
					2017	24.3	21.6	14.9	64.5	В	В	A	В	-0.32	2.6	-1.3	AB	0.78	AB	-0.59	Ā	2.6	BC	1.9
					2018	29.6	18.3	31.9	31.1	Α	Α	Α	Α	-3.7	0.37	0.56	Α	1.0	ABC	-1.1	В	-0.056	Α	3.9
%Plecoptera	log ₁₀	<0.001	<0.001	<0.001	2019	16.7	10.9	24.8	24.2	AB	В	Α	Α	-0.78	0.68	0.72	ABCD	0.27	BC	-2.6	В	-0.97	AB	3.2
					2020	10.5	11.0	26.2	45.4	В	В	Α	Α	0.058	2.0	1.3	CD	-0.34	BC	-2.6	AB	1.3	AB	3.4
					2021	21.2	10.0	11.2	34.2	A	В	Α	В	-1.6	1.0	-1.4	ABC	0.59	С	-2.9	AB	0.29	CD	1.2
					2022	9.64	15.9	13.6	27.0	В	AB	Α	В	0.85	1.7	0.58	D	-0.46	ABC	-1.5	В	-0.58	BCD	1.7

P-value <0.1.

P-value <0.1 and MOD >2. P-value <0.1 and MOD < -2.

Notes: MCT = measure of central tendency; MOD = magnitude of difference; % = percent; No. = number; m² = square metres; < = less than; g = grams; LPL = lowest practical level; EPT = Ephemeroptera, Plecoptera, and Trichoptera; - = not applicable; > = greater than; SD = standard deviation. Letters A, B, C, etc. are used to illustrate similarities and differences among areas and years (e.g., areas assigned "A" and "B" letter contrasts have significantly different organism densities).

 $^{^{}a}$  MOD = (MCT_{Upstream}-MCT_{GHBP})/SD_{GHBP}.

 $^{^{}b}$  MOD = (MCT_{year}-MCT₂₀₁₆)/SD₂₀₁₆.

 $^{^{\}rm c}$  MOD could not be calculated because baseline SD = 0.

Table G.18: Comparison of Benthic Invertebrate Community Endpoints Among Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas of Greenhills Creek, 2016 to 2022

			P-values				14	O.T.				, ,	rea Contrast	ts						Temporal (	Contrasts			
Endpoint	Transformation	Year x	Year	Aros	Year		M	<b>5</b> 1			Letter C	ontrasts			MOD (%) a		RG_	GHBP	RG	_GHUT	RG_	GHNF	RG_	_GHFF
		Area	rear	Area		RG_GHBP	RG_GHUT	RG_GHFF	RG_GHNF	RG_GHBP	RG_GHUT	RG_GHNF	RG_GHFF	RG_GHUT	RG_GHNF	RG_GHFF	Letter	MOD (%) b	Letter	MOD (%) b	Letter	MOD (%) b	Letter	MOD (%)
					2016	12.1	2.14	3.13	0.336	Α	BC	С	В	-2.1	-2.4	-1.9	Α	baseline	AB	baseline	AB	baseline	Α	baseline
					2017	7.95	0.802	2.33	0	Α	BC	С	AB	-2.0	-2.2	-1.5	Α	-0.86	AC	-0.99	AB	-0.67	Α	-0.69
					2018	10.4	0.258	1.32	0	Α	В	В	В	-4.1	-4.2	-3.6	Α	-0.35	С	-1.4	В	-0.67	Α	-1.6
%Trichoptera	rank	0.047	0.003	<0.001	2019	9.38	1.06	1.22	1.03	Α	В	В	В	-1.5	-1.5	-1.5	Α	-0.56	ABC	-0.79	AB	1.4	Α	-1.6
					2020	12.0	6.17	2.43	1.41	Α	В	В	В	-1.5	-2.8	-2.5	Α	-0.017	AB	3.0	AB	2.2	Α	-0.60
					2021	9.52	5.21	0.838	1.77	Α	AB	BC	С	-1.6	-2.9	-3.2	Α	-0.53	В	2.3	Α	2.9	Α	-2.0
					2022	10.3	1.70	2.87	0.216	Α	BC	С	В	-3.2	-3.8	-2.8	Α	-0.38	ABC	-0.33	AB	-0.24	Α	-0.23
					2016	38.6	61.2	86.8	59.6	С	В	В	Α	2.6	2.4	5.6	Α	baseline	В	baseline	AB	baseline	Α	baseline
					2017	42.9	69.8	77.4	29.7	В	Α	В	Α	5.2	-2.6	6.7	Α	0.50	AB	1.9	С	-2.8	AB	-6.7
					2018	46.2	73.1	64.4	62.2	В	Α	Α	Α	4.1	2.4	2.7	Α	0.88	AB	2.7	AB	0.24	С	-16
%Diptera	rank	<0.001	0.004	<0.001	2019	26.5	80.3	73.1	68.8	С	Α	В	AB	9.0	7.1	7.8	Α	-1.4	Α	4.3	Α	0.85	BC	-9.7
					2020	32.8	76.5	66.4	48.8	В	Α	В	Α	6.0	2.2	4.6	Α	-0.68	Α	3.4	BC	-1.0	BC	-14
					2021	18.9	80.2	86.5	62.5	С	Α	В	Α	8.3	5.9	9.1	Α	-2.3	Α	4.3	AB	0.27	Α	-0.21
					2022	41.8	77.0	77.7	63.2	С	AB	В	Α	2.8	1.7	2.9	Α	0.37	Α	3.5	AB	0.33	AB	-6.5

P-value <0.1.
P-value <0.1 a
P-value <0.1 a

P-value <0.1 and MOD >2. P-value <0.1 and MOD < -2.

Notes: MCT = measure of central tendency; MOD = magnitude of difference; % = percent; No. = number; m² = square metres; < = less than; g = grams; LPL = lowest practical level; EPT = Ephemeroptera, Plecoptera, and Trichoptera; - = not applicable; > = greater than; SD = standard deviation. Letters A, B, C, etc. are used to illustrate similarities and differences among areas and years (e.g., areas assigned "A" and "B" letter contrasts have significantly different organism densities).

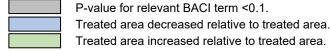
 $^{^{}a}$  MOD = (MCT_{Upstream}-MCT_{GHBP})/SD_{GHBP}.

 $^{^{}b}$  MOD = (MCT_{year}-MCT₂₀₁₆)/SD₂₀₁₆.

 $^{^{\}rm c}$  MOD could not be calculated because baseline SD = 0.

Table G.19: Comparison of Benthic Invertebrate Community Endpoints for Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas Before (2016 and 2017) and After (2018 to 2022) Treatment: No Significant Interactions

Endpoint	Term	P-value	MOD ^a between Treated and Untreated, Before and After Treatment
	BA	0.257	-
	CI	<0.001	-
	BA x CI	0.756	NS
%Trichoptera	Year(BA)	0.007	-
76 I Hichoptera	Area(CI)	0.102	-
	Year(BA) x CI	0.240	-
	Area(CI) x BA	0.381	-
	Area(CI) x Year(BA)	0.761	-



Notes: MOD = Magnitude of Difference; BA = Before-After; - = no data/not applicable; CI = Control-Impact; NS = not significant; SD = standard deviation. MODs not shaded were not significant in the *post hoc* analysis using a p-value of 0.1 and corrected for the number of tests.

 $^{^{}a}\,\mathsf{MOD} = (\mathsf{AfterYear}_{\mathsf{untreated}}\,\mathsf{-AfterYear}_{\mathsf{treated}}) \mathsf{-(BeforeYear}_{\mathsf{untreated}}\,\mathsf{-BeforeYear}_{\mathsf{treated}})\,/\mathsf{SD}.$ 

Table G.20: Comparisons of Benthic Invertebrate Community Endpoints for Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas Before (2016 and 2017) and After (2018 to 2022) Treatment: Significant Year and Area Interactions

							MOE	D for Years Before	(2016 and 201	7) and Afte	r (2018 to 2022	) Treatmen	t ^a					
Endpoint	Term	P-value		RG_GHBP ver	rsus RG_GHU				RG_GHBP ve	rsus RG_GI					GHBP ve	rsus RG_GH		
apot		· value	20			2017		2016			2017			2016			2017	
			2018 2019 20	20 2021 2022	2018 2019	2020 2021 20	22 20	018 2019 2020	2021 2022	2018 20	019   2020   20	21 2022	2018 2019	2020 202	21 2022	2018 2019	9 2020 2	021 2022
-	BA	<0.001																
-	CI	0.002																
Donoitu	BA x CI	0.004																
Density	Year(BA)	<0.001 <0.001			-					-						-		
(No./m²)	Area(CI) Year(BA) x CI	0.764																
-	Area(CI) x BA	0.764																
	Area(CI) x Year(BA)	0.129	2.06   1.00   2.4	15 1 65 10 923	N 108 N 0375	0.501 -0.208 -0	9/0 1	.79 2.23 1.15	235 265	1 17   1	60 0 526 1	73 2 03	0.053 1.14	1 80 10 66	88 1 03	0.427 0.61	8 1 36 10	1/2 0 502
	BA	<0.001	2.00 1.90 2.	1.00   0.920	0.190 0.0373	0.091 [-0.200]-0.	340 1	.79   2.23   1.10	2.00	1.17   1.	.00   0.020   1.	70   2.00	0.900 1.14	1.09 0.00	1.00	0.427   0.01	0 1.50 0.	142 0.502
	CI	<0.001																
	BA x CI	0.053																
Total	Year(BA)	<0.001			_					_						_		
Biomass	Area(CI)	0.002																
(g/m²)	Year(BA) x CI	0.059																
	Area(CI) x BA	0.556																
	Area(CI) x Year(BA)	0.010	2.53 1.44 2.6	55 1.00 0.709	0.607 -0.478	0.728 -0.917 -1	.21 1	.21 0.966 1.36	0.645 2.17	0.780 0.	540 0.938 0.2	218 1.74	1.75 0.712	2.24 -0.5	45 0.853	0.834 -0.20	3 1.33 -1	.46 -0.0626
	BA	<0.001																
	CI	<0.001																
	BA x CI	0.003																
LPL	Year(BA)	0.125			-					-						-		
Richness	Area(CI)	0.145																
	Year(BA) x CI	0.365																
	Area(CI) x BA Area(CI) x Year(BA)	0.091	0.270   4.02   4.4	00 265 120	1 24   0 496	0.246   4.42   0.	216 0	.324 1.03 0.216	246 4 04	0.757 2	11 1 20 2	24 2 42	160 157	1.05   0.0	10 2 22	125 120	1 4 60 10	640 4.05
	BA	0.007	0.270 1.03 1.0	00 2.00 1.00	-1.24  -0.400	-0.210 1.13 -0.	210 -0.	.324 1.03 0.210	2.10 1.04	0.757 2.	.11 1.30 3.	24   2.13	1.02   1.37	1.95 0.9	19 2.22	1.33 1.30	J 1.00 U.	049 1.95
	Cl	<0.007																
	BA x CI	0.140																
Family	Year(BA)	0.218			_					_						_		
Richness	Area(CI)	<0.001																
	Year(BA) x CI	0.696																
	Area(CI) x BA	0.103																
	Area(CI) x Year(BA)	0.020	-0.476 0.0793	1.67 0.793	-1.11 -0.555	-0.635 1.03 0.1	159 -0.	.397 0.238 -0.0793	0.582 0.661	0.238 0.8	873 0.555 1.3	22 1.30	1.67 0.793	1.03 0.4	76 2.06	1.51 0.63	5 0.873 0.	317 1.90
	BA	0.610																
	CI	<0.001																
	BA x CI	0.002																
0/	Year(BA)	0.001			_					_						_		
%EPT	Area(CI)	<0.001																
}	Year(BA) x CI	<0.001																
}	Area(CI) x BA	<0.001																
}	Area(CI) x Year(BA)		-2.47 -4.64 1	55 -166 190	-1 27 2 /2	_0.350 _0.451 _0	687 1	1.56 -3.07 1.04	0.584 0.70	7 _/ 17 5	68 _1 58 2	03 -3 40	0 030   1 20	1 05 10 02	13h 0000	0.404 1.7	3 151 0	/11 _0 /36
	AIGA(OI) A TEAI(DA)	<b>\0.001</b>	- <del>2.41 -4.04 -</del> 1.	00 -1.00 -1.09	-1.21 -3.43	-0.000 -0.401 -0.	-1	1.00 -3.01 1.04	0.304 -0.70	-4.17 -3	.00 -1.00 -2.	-3.40	0.838 -1.28	1.85 0.03	JP.00807	U.434 -1.7	0 1.01 [-0]	.+111-0.430

P-value for relevant BACI term <0.1.

Treated area decreased relative to treated area.

Treated area increased relative to treated area.

Notes: MOD = Magnitude of Difference; No. = number; m² = square metre; BA = Before-After; < = less than; - = no data/not applicable; CI = Control-Impact; g = gram; LPL = Lowest Practical Level; % = percent; SD = standard deviation. MODs not shaded were not significant in the post hoc analysis us a MOD = (AfterYear_untreated -AfterYear_treated) - (BeforeYear_treated) ble G.20: Comparisons of Benthic Invertebrate Community Endpoints for Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas Before (2016 and 2017) and After (2018 to 2022) Treatment: Significant Year and Area Interactions

							ı	MOD for Y	ears Before	(2016 a	nd 2017)	and Aft	er (201	8 to 2022) T	reatme	nt ^a						
Endpoint	Term	P-value		RG_GHBP	versus RG_G	HUT				RG_GH	BP vers	us RG_C	SHNF					RG_GHBP	versus F	RG_GHF	F	
2.10,011.1	10	· value		016		2017			2016					2017		_	2016				2017	
			2018 2019 2	020 2021 203	22 2018 20	2020	2021 2022	2018 2	2019 2020	2021	2022	2018 2	2019	2020 2021	2022	2018 2019	2020	2021 202	2 2018	2019	2020 202	21 2022
	BA	0.020																				
	CI	<0.001																				
	BA x CI	0.487																				
%Plecoptera	Year(BA)	<0.001			-						-								-			
701 ICCOPTCIA	Area(CI)	<0.001																				
	Year(BA) x CI	0.075																				
	Area(CI) x BA	<0.001																				
	Area(CI) x Year(BA)	<0.001	-2.18 -1.92 -	1.30 -2.29 -0.6	20 -0.755 -0.	497 0.122	-0.868 0.807	-1.45 -0	0.479 1.66	0.118	0.302	-3.89 -	2.92 -	0.784 -2.32	-2.14	1.22 1.65	2.64	-0.185 1.2	4 1.23	1.66	2.65 -0.1	77 1.25
	BA	0.140																				
	CI	<0.001																				
	BA x CI	0.013																				
%Diptera	Year(BA)	0.031			-						-								-			
70Diptora	Area(CI)	<0.001																				
	Year(BA) x CI	<0.001																				
	Area(CI) x BA	<0.001																				
	Area(CI) x Year(BA)	<0.001	0.381 2.69 1	.69 2.86 0.8	57 0.242 2	.55 1.55	2.72 0.718	-0.716	1.12 -0.835	0.545	-0.268	2.94	4.78	2.82 4.20	3.39	-3.05 -0.68	2 -1.88	0.786 -1.3	0 -1.51	0.858	-0.345 2.3	3 0.239

P-value for relevant BACI term <0.1.

Treated area decreased relative to treated area.

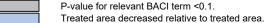
Treated area increased relative to treated area.

Notes: MOD = Magnitude of Difference; No. = number; m² = square metre; BA = Before-After; < = less than; - = no data/not applicable; CI = Control-Impact; g = gram; LPL = Lowest Practical Level; % = percent; SD = standard deviation. MODs not shaded were not significant in the post hoc analysis using a p-value of 0.1 and corrected for the number of tests.

 $^{a}\,\text{MOD} = (\text{AfterYear}_{\text{untreated}}\,\text{-AfterYear}_{\text{treated}}) - (\text{BeforeYear}_{\text{untreated}}\,\text{-BeforeYear}_{\text{treated}})\,/\text{SD}.$ 

Table G.21: Comparison of Benthic Invertebrate Community Endpoints for Treated (RG_GHBP) and Untreated (RG_GHUT, RG_GHNF, and RG_GHFF) Areas Before (2016 and 2017) and After (2018 to 2022) Treatment: Significant **Year Interactions** 

						Treat	ed versus l	Jntreated I	MOD ^a			
Endpoint	Term	P-value			2016					2017		
			2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
	BA	<0.001										
	CI	<0.001										
	BA x CI	<0.001						-				
% Enhamarantara	Year(BA)	<0.001										
%Ephemeroptera	Area(CI)	0.191										
	Year(BA) x CI	<0.001	-1.71	-15.8	-2.38	0.274	-6.64	-1.27	-15.3	-1.94	0.721	-6.19
	Area(CI) x BA	0.965	-	-								
	Area(CI) x Year(BA)	0.988						-				



Treated area increased relative to treated area.

Notes: MOD = Magnitude of Difference; % = percent; BA = Before-After; < = less than; - = no data/not applicable; CI = Control-Impact; SD = standard deviation. MODs not shaded were not significant in the *post hoc* analysis using a p-value of 0.1 and corrected for the number of tests.

^a MOD = (AfterYear_{untreated} -AfterYear_{treated})-(BeforeYear_{untreated} -BeforeYear_{treated}) /SD.

Table G.22: Summary of Benthic Invertebrate Endpoints Collected by Timed Kick and Sweep Sampling at Greenhills Creek, September 2022^a

Watercourse	Biological Area Code	Replicate	Abundance	LPL Richness (No. of taxa)	Family Richness	%EPT	%Ephemeroptera	%Plecoptera	%Trichoptera	%Diptera	EPT Abundance	Ephemeroptera Abundance	Plecoptera Abundance	Trichoptera Abundance	Diptera Abundance
		1	1,637	21	13	61	0.64	58	2.6	37	995	10	942	42	611
	RG_GHNF	2	344	25	14	35	0	20	14	61	119	0	70	49	211
Upper Greenhills		3	10,840	18	9.0	16	0	16	0	83	1,700	0	1,700	0	9,020
Creek		1	322	24	14	29	0	26	2.2	70	92	0	85	7.0	226
	RG_GHDT	2	714	22	15	30	0	29	0.56	68	214	0	210	4.0	484
		3	327	30	20	31	0.31	26	4.0	66	100	1.0	86	13	217
Lower		1	2,642	21	16	35	8.2	13	14	43	917	217	342	358	1,133
Greenhills	RG_GHCKD b	2	1,543	22	17	33	12	11	9.6	41	505	186	171	148	638
Creek		3	1,957	18	15	42	17	11	13	30	819	338	224	257	590

Notes: LPL = Lowest Practical Level; No. = number; % = percent; EPT = Ephemeroptera, Plecoptera, Trichoptera; CABIN = Canadian Aquatic Biomonitoring Network; RAEMP = Regional Aquatic Effects Monitoring Program.

^a Samples were collected using three-minute kicks consistent with CABIN protocols. Organism abundances are expressed as no. of organisms/three-minute kick

^b Biological monitoring area RG_GHCKD is a RAEMP monitoring area.

Table G.23: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Abundance					
Himban Laval	l Classification	F!l	Lowest Practical Level	2012		20	)14			20	15		20	)21
Higher Level	l Classification	Family	Identification	RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHNF-1	RG_GHNF-2
Clitellata	Tubificida	Naididae	Nais	0	0	50	0	20	0	0	6	1	0	40
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	0	0	0	0	0
Clitellata		Enchytraeidae	Enchytraeus	0	0	0	0	0	0	8	18	1	0	0
Collembola	Collembola	-	Collembola	0	0	0	0	0	0	0	0	0	20	0
Euchelicerata	Sarcoptiformes	-	Oribatida	0	0	0	0	20	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	1	20	2	0	0	0	0	0
Euchelicerata	Trombidiformes	Sperchontidae	Sperchon	0	0	0	1	0	2	0	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	11	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae Elmidae	Stictotarsus Heterlimnius	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta	Coleoptera Coleoptera	Elmidae	Optioservus	0	0	0	0	0	0	0	6	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	1	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0	0	0	3	0	1	0	0
Insecta	Diptera	Chironomidae	Brillia	0	0	0	3	21	0	0	0	0	17	90
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0	21	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	0	0	0	0	0	0	17	22
Insecta	Diptera	Chironomidae	Diamesa	3,156	339	233	331	1,397	8	5	62	17	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	1,155	608	26	0	13	24	37	21	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0	0	0	0	0	0	9	315
Insecta	Diptera	Chironomidae	Hydrobaenus	0	0	91	0	21	15	26	37	1	0	157
Insecta	Diptera	Chironomidae	Limnophyes	0	0	0	0	0	0	0	12	0	26	22
Insecta	Diptera	Chironomidae	Micropsectra	0	11	13	5	317	10	16	0	1	17	900
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0	0	418	391	1,091	75	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	0	731	491	83	2,666	0	0	0	0	69	360
Insecta	Diptera	Chironomidae	Pagastia	0	53	0	0	42	13	18	19	0	111	652
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	0	0	0	3	0	0	0	0
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	21	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0	0	0	3	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	0	13	2	42	8	16	12	3	9	135
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0	0	0	0	6	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	13	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0	21	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellinella	0	0	0	0	0	5	0	0	0	0	0
Insecta	Diptera	Chironomidae	Thienemanniella	0	0	0	0	21	0	0	31	0	0	0
Insecta	Diptera	Chironomidae	Tvetenia	0	0	39	6	169	18	5	50	15	146	495
Insecta	Diptera	Chironomidae	Zavrelimyia	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Dixidae	Dixa	0	0	0	0	0	0	0	0	0	7	0
Insecta	Diptera	Empididae	Chelifera/Metachela	11	0	25	3	0	13	18	0	4	0	0
Insecta	Diptera	Empididae	Clinocera	0	20	0	3	0	0	0	0	15 0	0	60
Insecta	Diptera Diptera	Empididae Empididae	Neoplasta	0	0	0	0	0	0	0	0	0	0	0
Insecta Insecta		Muscidae	Trichoclinocera	0	-	0	0	-	0	0	~	0	-	0
Insecta	Diptera Diptera	Pelecorhynchidae	Muscidae Glutops	0	10	0	0	220 0	0	0	76 0	1	13	0
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	56	60	75	7	120	29	3	82	7	240	723
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	1	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	1	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	1	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	11	141	50	16	0	7	3	0	19	0	0
Insecta	Diptera	Tipulidae	Dicranota	33	10	100	7	60	20	10	6	32	107	301
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0	0	0	0	0	1	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	67	10	50	6	0	0	2	0	3	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0	0	0	0	0	1	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0	0	0	0	6	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	20	0	0	40	9	8	0	2	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0	0	0	2	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	122	60	25	12	80	4	18	6	1	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0	0	2	0	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0	0	0	0	0	3	0	0
Insecta	Plecoptera	Capniidae	Capniidae	22	180	775	78	700	11	22	382	57	1,168	1,598
Insecta	Plecoptera	Capniidae	Mesocapnia	0	0	0	0	0	0	0	0	0	0	0

Table G.23: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon							Abundance					
Higher I evel	Classification	Family	Lowest Practical Level	2012		20	14			20	15		20	21
riigilei Levei	Olassincation	1 anniy	Identification	RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHNF-1	RG_GHNF-2
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	0	0	3	0	0	12	6	1	7	20
Insecta	Plecoptera	Leuctridae	Leuctridae	0	0	0	0	0	0	0	0	0	21	61
Insecta	Plecoptera	Nemouridae	Malenka	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	153	570	3	350	62	38	329	7	186	1,527
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	44	380	3	210	11	0	0	0	0	31
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	44	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	1	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	7	60	0	0	29	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	20	125	0	0	22	15	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	117	344
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	50	562	14	240	67	98	0	3	55	40
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	12	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	4	7	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	11	0	112	0	40	0	3	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	22	10	0	6	0	0	14	6	0	0	120
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	11	0	0	7	0	2	3	0	1	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	11	10	0	1	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	153	570	3	350	62	38	329	7	186	1,527
Insecta	Plecoptera	Nemouridae	Zapada columbiana	0	44	380	3	210	11	0	0	0	0	31
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	44	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	1	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	7	60	0	0	29	0	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	20	125	0	0	22	15	0	0	0	0
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0	0	0	0	0	0	117	344
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	50	562	14	240	67	98	0	3	55	40
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	12	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0	0	4	7	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	11	0	112	0	40	0	3	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	22	10	0	6	0	0	14	6	0	0	120
-	<u> </u>		<u>'</u> -	0	0	0	0	0	0	0	0	0	0	0

Table G.23: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon			Abun	dance	
Higher I evel	Classification	Family	Lowest Practical Level	2021		2022	
Tilgilei Level		-	Identification	RG_GHNF-3	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	Nais	15	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	11	0	9
Clitellata	-	Enchytraeidae	Enchytraeus	0	21	0	0
Collembola	Collembola	-	Collembola	10	0	0	2
Euchelicerata	Sarcoptiformes	- Lebertiidae	Oribatida	0	0	0	1
Euchelicerata Euchelicerata	Trombidiformes Trombidiformes	Sperchontidae	Lebertia Sperchon	0	0	0	0
Insecta	Coleoptera	Curculionidae	Curculionidae	0	0	0	0
Insecta	Coleoptera	Dytiscidae	Stictotarsus	0	0	0	0
Insecta	Coleoptera	Elmidae	Heterlimnius	0	0	0	0
Insecta	Coleoptera	Elmidae	Optioservus	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Probezzia	0	0	0	0
Insecta	Diptera	Chironomidae	Boreoheptagyia	0	0	0	0
Insecta	Diptera	Chironomidae	Brillia	6	0	0	0
Insecta	Diptera	Chironomidae	Chaetocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Corynoneura	0	0	0	1
Insecta	Diptera	Chironomidae	Diamesa	0	0	0	0
Insecta	Diptera	Chironomidae	Eukiefferiella	0	6	0	0
Insecta	Diptera	Chironomidae	Heleniella	0	0	0	0
Insecta	Diptera	Chironomidae	Hydrobaenus	0	57	0	96
Insecta	Diptera	Chironomidae	Limnophyes	6	0	0	2
Insecta	Diptera	Chironomidae	Micropsectra	34	0	0	1
Insecta	Diptera	Chironomidae	Monodiamesa	0	0	0	1
Insecta	Diptera	Chironomidae	Orthocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Orthocladius complex	56	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	689	68	0	5
Insecta	Diptera	Chironomidae	Parametriocnemus	0	0	0	1
Insecta	Diptera	Chironomidae	Paraphaenocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Parorthocladius	0	0	0	0
Insecta	Diptera	Chironomidae	Pseudodiamesa	0	91	0	30
Insecta	Diptera	Chironomidae	Rheocricotopus	0	0	0	0
Insecta	Diptera	Chironomidae	Rheotanytarsus	0	0	0	0
Insecta	Diptera	Chironomidae	Stempellina	0	0	0	0
Insecta	Diptera	Chironomidae Chironomidae	Stempellinella Thienemanniella	0	0	0	0
Insecta Insecta	Diptera Diptera	Chironomidae	Tvetenia	330	210	0	4
Insecta	Diptera	Chironomidae	Zavrelimyia	0	11	0	7
Insecta	Diptera	Dixidae	Dixa	0	0	0	0
Insecta	Diptera	Empididae	Chelifera/Metachela	0	0	0	0
Insecta	Diptera	Empididae	Clinocera	0	0	0	0
Insecta	Diptera	Empididae	Neoplasta	35	120	0	23
Insecta	Diptera	Empididae	Trichoclinocera	0	6	0	0
Insecta	Diptera	Muscidae	Muscidae	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	Glutops	0	11	0	4
Insecta	Diptera	Psychodidae	Pericoma/Telmatoscopus	70	21	0	27
Insecta	Diptera	Psychodidae	Psychoda	0	0	0	0
Insecta	Diptera	Simuliidae	Gymnopais	0	0	0	0
Insecta	Diptera	Simuliidae	Prosimulium/Helodon	0	0	0	0
Insecta	Diptera	Simuliidae	Simulium	0	0	0	0
Insecta	Diptera	Tipulidae	Dicranota	110	11	0	8
Insecta	Ephemeroptera	Ameletidae	Ameletidae	0	0	0	0
Insecta	Ephemeroptera	Baetidae	Baetis rhodani group	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella doddsii	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Drunella grandis group	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae	0	11	0	0
Insecta	Ephemeroptera	Heptageniidae	Epeorus	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Heptageniidae	0	0	0	0
Insecta	Ephemeroptera	Heptageniidae	Rhithrogena	0	0	0	0
Insecta	Plecoptera	Capniidae	Capnia	0	0	0	0
Insecta	Plecoptera	Capniidae	Capniidae	307	468	0	27
Insecta	Plecoptera	Capniidae	Mesocapnia	0	6	0	2

Table G.23: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek, Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon			Abun	dance	
Halaan Lassa	l Classification	Familia	Lowest Practical Level	2021		2022	
Higher Leve	el Classification	Family	Identification	RG GHNF-3	RG GHNF-1	RG GHNF-2	RG GHNF-3
Insecta	Plecoptera	Chloroperlidae	Sweltsa	0	67	0	0
Insecta	Plecoptera	Leuctridae	Leuctridae	16	0	0	0
Insecta	Plecoptera	Nemouridae	Malenka	0	25	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	25	0	2
Insecta	Plecoptera	Nemouridae	Zapada columbiana	402	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	31
Insecta	Plecoptera	Perlodidae	Kogotus	164	351	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	8
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	222	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	10	42	0	48
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	0	0	0	1
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	0	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada cinctipes	0	25	0	2
Insecta	Plecoptera	Nemouridae	Zapada columbiana	402	0	0	0
Insecta	Plecoptera	Nemouridae	Zapada oregonensis group	0	0	0	0
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	0	0	0
Insecta	Plecoptera	Perlodidae	Isoperla	0	0	0	31
Insecta	Plecoptera	Perlodidae	Kogotus	164	351	0	0
Insecta	Plecoptera	Perlodidae	Megarcys	0	0	0	8
Insecta	Plecoptera	Perlodidae	Skwala	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	222	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	Glossosomatidae	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	0	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	10	42	0	48
-	-	_	-	0	0	0	0

Table G.24: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Upper Greenhills Creek Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon									Abundance							
Higher Level (	Classification	Family	2012		20	14			20	)15			2021			2022	
Higher Level	Classification	ramny	RG_GHCKU-1	GREE3-25-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHCKU-1	GREE3-75-1	GREE4-25-1	GREE4-75-1	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3	RG_GHNF-1	RG_GHNF-2	RG_GHNF-3
Clitellata	Tubificida	Naididae	0	0	50	0	20	0	0	6	1	0	40	15	11	0	9
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	8	18	1	0	0	0	21	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hygrobatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	1	20	2	0	0	0	0	0	0	0	0	2
Euchelicerata	Trombidiformes	Sperchontidae	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Torrenticolidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	0	1	0	0	0	6	0	0	0	0	0	0	0
Insecta	Coleoptera	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	3,156	2,309	1,500	456	4,740	507	510	1,359	135	420	3,195	1,120	442	0	149
Insecta	Diptera	Dixidae	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Insecta	Diptera	Empididae	11	20	25	5	0	13	18	0	19	0	60	35	126	0	23
Insecta	Diptera	Muscidae	0	10	0	0	220	0	0	76	0	13	0	0	0	0	0
Insecta	Diptera	Pelecorhynchidae	0	0	0	0	0	0	0	0	1	0	0	0	11	0	4
Insecta	Diptera	Psychodidae	56	60	75	8	120	29	3	82	7	240	723	70	21	0	27
Insecta	Diptera	Sciomyzidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Simuliidae	11	141	50	18	0	7	3	0	19	0	0	0	0	0	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Tipulidae	33	10	100	7	60	20	10	6	32	107	301	110	11	0	8
Insecta	Ephemeroptera	Ameletidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	67	10	50	6	0	0	2	0	3	0	0	0	0	0	0
Insecta	Ephemeroptera	Ephemerellidae	0	20	0	0	40	9	8	6	3	0	0	0	11	0	0
Insecta	Ephemeroptera	Heptageniidae	122	60	25	12	80	7	20	6	1	0	0	0	0	0	0
Insecta	Plecoptera	Capniidae	22	180	775	78	700	11	22	382	60	1,168	1,598	307	474	0	29
Insecta	Plecoptera	Chloroperlidae	0	0	0	3	0	0	12	6	1	7	20	0	67	0	0
Insecta	Plecoptera	Leuctridae	0	0	0	0	0	0	0	0	0	21	61	16	0	0	0
Insecta	Plecoptera	Nemouridae	0	240	950	6	560	73	38	329	7	186	1,557	402	50	0	2
Insecta	Plecoptera	Peltoperlidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	20	125	7	60	22	15	29	0	117	344	164	351	0	39
Insecta	Plecoptera	Taeniopterygidae	0	50	562	14	240	67	98	0	3	55	40	222	0	0	0
Insecta	Trichoptera	Apataniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Glossosomatidae	0	0	0	0	0	4	7	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	11	0	112	0	40	0	3	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Limnephilidae	22	10	0	6	0	0	14	6	0	0	120	10	42	0	48
Insecta	Trichoptera	Rhyacophilidae	22	10	0	8	0	2	3	0	1	0	0	0	0	0	1
Malacostraca	Amphipoda	Gammaridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	-	Collembola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.25: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

Part   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company   Company						Abundance								Taxon		
New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New   New	2022	2022		2021		1	2019	2018	15	20	2014	2012	Lowest Practical		N '5 '	111.1
Decision   Versecoids	GHCKD-2 RG GHCKD	RG GHCKD-1 RG GHCKE	G GHCKD-3	G GHCKD-2	RG GHCKD-1 R				GREE1-50-1	RG GHCKD-1		-		Family	Classification	Higher Level
Celebral   Tableton   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December   December			_	_		_	_	_		_	_		Pisidiidae	Pisidiidae	Veneroida	Bivalvia
Citeblas   Tablesta   National   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta   Tablesta	0 0	0 0	0	0	0	0	30	0	0	0	0	0	Lumbriculidae	Lumbriculidae	Lumbriculida	Clitellata
Collettions	0 0	0 0	0	0	0	0	0	80	0		180	220	Nais	Naididae	Tubificida	Clitellata
Coloradia   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide   Hypogesturide	0 0	0 0	40	60	43	0	0	0		,	0	0	Tubificinae	Naididae	Tubificida	Clitellata
Eucleicement   Susceptionness			ŭ	ŭ		-	~	ŭ				•		,		
Excinentezeral   Tenhistoremes   Alundace   Alundace   0   0   199   0   0   0   0   0   0   0   0   0			•	Ū		·	Ů		·		•			Hypogastruridae		
Euclasticonsists   Trombolitations   Febilisis   0   80   0   0   0   0   0   0   0						ŭ	•	•	Ŭ					-		
Eurobisterest   Tembiothomes   Hypropacitide   Protect   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   Caberial   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   September   Septembe			-	Ü	_	•		· ·				-				
Exchelicorate   Transitiofrances   Coherentian   Lobratian   Spectron   30   20   192   0   100   38   14   14   20   180   29   24			-	0		-	•	·	Ŭ							
Euchericonistal Transitationness   Spent contides   Spent Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Spent   Sp		· · · · · · · · · · · · · · · · · · ·		0			•	·		•	- U	-				
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Insectin   Colespiera   Elimidae   Heteritimus   0   0   0   0   0   0   0   0   0			-	Ū		•	~		Ŭ							
Insecta				Ū		-			Ŭ						•	
Insecta			-	ŭ			-	· ·	•	ŭ		-				
Insecta   Diplera   Ceratopogniciale   Escaria Palpamyia   O   O   O   O   O   O   O   O   O				U	-	-						·	•		•	
Insecta   Diplera   Ceratopogondae   Malicothoriesa   20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			ŭ	U	-	-				-			. ,	. ,		
Insecta				0	-	-	<u> </u>	·		-	0	· · · · · · · · · · · · · · · · · · ·	1 7			
Insecta   Diptera   Chinonomidae   Carynoneuria   0   0   0   0   0   0   0   0   0	0 0	0 0	0	0	0	129	0	0	0	0	0				•	
Insecta   Diptera   Chironomidae   Eusteffeelia   220   62   0   0   0   0   0   0   0   0   0			0	0	0	-		22	0	0	0	0				
Insecta   Diptera   Chironomidae   Helenielia   D   0   42   D   D   D   D   D   D   D   D   D	0 0	0 0	0	0	0	0	0	0	0	0	62	0	,	Chironomidae		Insecta
Insecta   Diptera   Chironomidae   Macropatopia   Deli   Deli   Chironomidae   Macropatopia   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli   Deli	0 0	0 0	0	0	0	0	0	0	0	21	62	220	Eukiefferiella	Chironomidae	Diptera	Insecta
Insecta   Diplera Chironomidae   Macropalopia   0   0   0   0   0   0   0   0   0				0	0	-	-		·					•		Insecta
Insecta   Diptera Chironomidae   Micropsectra   5,500   21   1,823   144   426   338   0   40   133   84   13   55			-	U	· ·		<u> </u>	·		· ·						
Insecta	1 0	0 1	-	Ū	·				•	•		· · · · · · · · · · · · · · · · · · ·			•	
Insecta   Diptera   Chironomidae   Orthocladius complex   0												- ,	<u> </u>			
Insecta		<u> </u>		ŭ		-										
Insecta   Diptera   Chironomidae   Parametrinoa   Diptera   Diptera   Chironomidae   Parametrinoa   Diptera   Diptera   Chironomidae   Parametrinoa   Diptera   Chironomidae   Parametrinoa   Diptera   Chironomidae   Parametrinoa   Diptera   Chironomidae   Parametrinoa   Diptera   Chironomidae   Perlanearura   Diptera   Diptera   Chironomidae   Perlanearura   Diptera   Chironomidae   Perlanearura   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Procladius   Diptera   Chironomidae   Stempelinella   Diptera   Chironomidae   Stempelinella   Diptera   Chironomidae   Stempelinella   Diptera   Chironomidae   Diptera   Chironomidae   Tretenia   Diptera   Chironomidae   Tretenia   Diptera   Chironomidae   Tretenia   Diptera   Diptera   Chironomidae   Tretenia   Diptera   Diptera   Chironomidae   Tretenia   Diptera   Diptera   Empididae   Neoplasta   Diptera   Empididae   Neoplasta   Diptera   Empididae   Neoplasta   Diptera   Diptera   Empididae   Neoplasta   Diptera   Diptera   Empididae   Stampelinella   Diptera   Diptera   Empididae   Stampelinella   Diptera   Empididae   Neoplasta   Diptera   Diptera   Stratiomyidae   Diptera   Stratiomyidae   Diptera   Stratiomyidae   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Dipter	7 0			• •	· ·	-		·	·				•			
Insecta   Diplera   Chronomidae   Parametriconemus   40				ŭ			×		ŭ							
Insecta   Diptera   Chironomidae   Paraphaenocladius   O   42   O   O   O   O   O   O   O   O   O	•	<u> </u>	~	Ü	· ·				, ,	U	•					
Insecta   Diptera   Chironomidae   Pentaneura   0   0   212   21   0   0   0   0   0   0   0   133   0				•	Ů	-	-		, ,	· ·						
Insecta   Diptera   Chironomidae   Procladius   0   0   42   82   0   0   0   0   0   0   0   0   0			ŭ	ŭ	U	Ŭ	~	ŭ	, and the second	ŭ		-				
Insecta   Diptera   Chironomidae   Rheotanytarsus   0   768   0   0   0   0   0   0   0   0   0			ŭ	•	Ů	ŭ	, , ,	ŭ			•				•	
Insecta   Diptera   Chironomidae   Stempelinella   0   0   657   0   0   0   0   0   0   0   0   0	0		•	•	Ŭ	ŭ	<u> </u>	Ū								
Insecta   Diptera   Chironomidae   Thienemanniella   0   0   21   82   0   0   0   120   178   112   0   0   0			-	-				ŭ	-	-			,			
Insecta   Diptera   Chironomidae   Tvetenia   0   0   21   0   0   0   0   0   0   0   0   0		, , , , , , , , , , , , , , , , , , ,		ŭ	120	-	-	- J	·		0		•		•	
Insecta   Diptera   Empididae   Chelifera/Metachela   80   260   180   0   0   0   0   0   0   0   0   0		0 7				0	-	0			0					
Insecta   Diptera   Empididae   Neoplasta   Diptera   Diptera   Pelecorhynchidae   Glutops   Diptera   Diptera   Pelecorhynchidae   Glutops   Diptera   Diptera   Psychodidae   Pericoma/Telmatoscopus   1,260   1,520   880   2,750   1,780   700   714   457   1,240   2,200   800   486   1,864   Diptera   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae   Simuliidae		0 0	0	0	0	0		0	0		260	80				
Insecta   Diptera   Psychodidae   Pericoma/Telmatoscopus   1,260   1,520   880   2,750   1,780   700   714   457   1,240   2,200   800   486	5 0	0 5	0	20	0	0	0	0	33	0	0	0	Neoplasta			Insecta
Insecta   Diptera   Simuliidae   Simulium   31,900   840   920   150   40   120   614   200   160   20   242   67	0 0	17 0	0	0	0	0	40	0	33	20	0	0	Glutops	Pelecorhynchidae	Diptera	Insecta
Insecta   Diptera   Stratiomyidae   Stratiomyidae   O   O   O   O   O   O   O   O   O			,	, -				,	,		,	,		•		
Insecta   Diptera   Tipulidae   Antocha   200   40   0   17   0   0   0   0   0   0   0   0   0																
Insecta   Diptera   Tipulidae   Dicranota   120   140   60   33   30   0   0   0   0   0   0   0					_	-		_		-			· · · · · · · · · · · · · · · · · · ·	•		
Insecta   Diptera   Tipulidae   Tipula   Diptera   Tipulidae   Tipula   Diptera   Diptera   Tipulidae   Tipula   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   Diptera   D				-		-										
Insecta   Ephemeroptera   Ameletidae   Ameletidae   Ameletidae   O   O   40   O   O   O   O   O   O   O   O   O			~	ŭ	-	ŭ										
Insecta   Ephemeroptera   Baetidae   Baetis rhodani group   0   20   560   333   180   1,030   357   43   40   20   217   186     Insecta   Ephemeroptera   Ephemerellidae   Drunella doddsii   0   0   40   0   0   0   0   14   0   0   0     Insecta   Ephemeroptera   Ephemerellidae   Ephemerellidae   Ephemerellidae   Ephemerellidae   O   0   0   0   0   0   0   0   0     Insecta   Ephemeroptera   Heptageniidae   Cinygmula   O   0   0   0   0   0   0   0   0   0			_	-		_							·			
Insecta   Ephemeroptera   Ephemeroptera   Ephemerellidae   Drunella doddsii   O   O   O   O   O   O   O   O   O																
Insecta   Ephemeroptera   Ephemeroptera   Ephemeroptera   Ephemeroptera   Heptageniidae   Cinygmula   O   O   O   O   O   O   O   O   O				-			,						<u> </u>			
Insecta   Ephemeroptera   Heptageniidae   Cinygmula   0   0   0   0   0   0   0   0   0			ŭ	-		-		_	•		•					
Insecta         Ephemeroptera         Heptageniidae         80         0         40         17         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0				_				_	-							
Insecta         Plecoptera         Capniidae         Capniidae         0         0         0         0         0         14         0         0         0         0         0           Insecta         Plecoptera         Chloroperlidae         Sweltsa         20         80         280         50         40         30         29         14         40         40         18         20           Insecta         Plecoptera         Leuctridae         Leuctridae         0         0         20         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0						-				·						
Insecta         Plecoptera         Chloroperlidae         Sweltsa         20         80         280         50         40         30         29         14         40         40         18         20           Insecta         Plecoptera         Leuctridae         Leuctridae         0         0         20         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         44         54				_				·					. 0			
Insecta         Plecoptera         Leuctridae         Leuctridae         0         0         20         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0													•			
Insecta Plecoptera Nemouridae Amphinemura 0 0 130 0 0 0 0 0 0 0 44 54														•	•	
						-									•	
	0 0		597	799	1,350	122	45	716	0	0	0	0	Malenka	Nemouridae	Plecoptera	Insecta
Insecta         Plecoptera         Nemouridae         Zapada cinctipes         300         420         130         1,233         564         145         1,536         1,107         1,681         783         228         88									1,233		420					

Table G.25: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Lowest Practical Level of Taxonomy, 2012 to 2022

		Taxon								Abundance						
Higher Level C	Noneification	Family	Lowest Practical	2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level C	Jiassilication	railily	Level Identification	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Insecta	Plecoptera	Peltoperlidae	Peltoperlidae	0	20	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	Kogotus	0	0	0	0	0	0	14	0	0	0	18	10	19
Insecta	Plecoptera	Perlodidae	Skwala	0	20	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Pteronarcyidae	Pteronarcella	0	0	0	17	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	Taeniopterygidae	0	0	0	0	0	0	14	43	0	100	35	0	5
Insecta	Trichoptera	Brachycentridae	Brachycentrus	20	0	0	0	0	99	0	0	0	0	0	0	0
Insecta	Trichoptera	Brachycentridae	Micrasema	0	40	316	50	96	0	73	130	100	230	0	6	6
Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	140	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Hydropsychidae	180	0	26	17	0	0	44	16	0	0	0	0	0
Insecta	Trichoptera	Hydropsychidae	Parapsyche elsis	0	0	0	0	0	0	15	0	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	Hydroptila	0	0	184	0	384	33	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	0	60	0	0	576	165	131	16	20	126	0	0	0
Insecta	Trichoptera	Limnephilidae	Limnephilidae	20	0	26	267	0	0	29	49	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	20	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	100	640	237	150	96	44	174	277	300	272	138	30	74
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila brunnea/vemna group	360	940	211	167	168	88	349	440	200	251	211	112	177
Insecta	Trichoptera	Rhyacophilidae	Rhyacophila narvae	0	0	0	0	0	0	0	0	0	0	9	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	440	0	67	0	0	0	43	143	100	60	58	90	19
Malacostraca	Amphipoda	Hyalellidae	Hyalella	0	20	33	0	0	0	0	14	0	0	0	0	0
-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0

Table G.26: Abundance (No./3-min Kick) of Benthic Invertebrate Taxa in Samples from Lower Greenhills Creek Based on the Family Level of Taxonomy, 2012 to 2022

	Taxon						Abun	dance						Abundance	
	01 '6" "		2012	2014	20	15	2018	2019	2020		2021			2022	
Higher Level	Classification	Family	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	GREE1-50-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3	RG_GHCKD-1	RG_GHCKD-2	RG_GHCKD-3
Bivalvia	Veneroida	Pisidiidae	20	0	540	167	1,180	590	357	886	1,220	1,580	483	271	471
Clitellata	Lumbriculida	Lumbriculidae	0	0	0	0	0	30	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	220	180	1,320	217	80	0	0	43	60	40	0	0	0
Clitellata	-	Enchytraeidae	0	0	360	133	0	0	0	0	0	0	0	0	0
Collembola	Collembola	Hypogastruridae	0	0	0	0	0	0	0	14	0	0	0	0	0
Euchelicerata	Sarcoptiformes	Hydrozetidae	0	0	20	0	0	0	0	14	20	20	17	5	10
Euchelicerata	Trombidiformes	Aturidae	0	0	108	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Feltriidae	0	80	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Hydryphantidae	0	0	0	0	0	0	14	0	0	0	0	0	13
Euchelicerata	Trombidiformes	Lebertiidae	30	20	152	0	100	38	14	14	20	180	25	24	25
Euchelicerata	Trombidiformes	Sperchontidae	30	0	0	0	0	12	0	0	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	5	0
Insecta	Coleoptera	Curculionidae	0	0	0	0	0	10	0	14	0	0	0	0	0
Insecta	Coleoptera	Elmidae	0	0	40	67	0	0	43	14	0	0	8	5	10
Insecta	Coleoptera	Staphylinidae	20	0	0	0	20	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	20	0	20	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	5,800	1,100	3,540	350	560	410	129	200	400	280	67	76	590
Insecta	Diptera	Empididae	80	260	180	33	0	0	0	0	20	0	0	5	0
Insecta	Diptera	Pelecorhynchidae	0	0	20	33	0	40	0	0	0	0	17	0	0
Insecta	Diptera	Psychodidae	1,260	1,520	880	2,750	1,780	700	714	457	1,240	2,200	800	486	0
Insecta	Diptera	Simuliidae	31,900	840	920	150	40	120	614	200	160	20	242	67	0
Insecta	Diptera	Stratiomyidae	0	0	0	0	0	0	0	0	0	20	0	0	0
Insecta	Diptera	Tipulidae	320	200	120	50	60	0	0	0	0	0	8	5	0
Insecta	Ephemeroptera	Ameletidae	0	0	40	0	0	0	0	0	0	0	0	0	0
Insecta	Ephemeroptera	Baetidae	0	20	560	333	180	1,030	357	43	40	20	217	186	333
Insecta	Ephemeroptera	Ephemerellidae	0	0	40	0	0	0	57	29	0	0	0	0	5
Insecta	Ephemeroptera	Heptageniidae	80	0	40	17	0	0	0	29	0	0	0	0	0
Insecta	Plecoptera	Capniidae	0	0	0	0	0	0	14	0	0	0	0	0	0
Insecta	Plecoptera	Chloroperlidae	20	80	280	50	40	30	29	14	40	40	18	20	24
Insecta	Plecoptera	Leuctridae	0	0	20	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Nemouridae	300	420	260	1,233	1,280	190	1,657	2,457	2,480	1,380	272	142	176
Insecta	Plecoptera	Peltoperlidae	0	20	0	0	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Perlodidae	0	20	0	0	0	0	14	0	0	0	18	10	19
Insecta	Plecoptera	Pteronarcyidae	0	0	0	17	0	0	0	0	0	0	0	0	0
Insecta	Plecoptera	Taeniopterygidae	0	0	0	0	0	0	14	43	0	100	35	0	5
Insecta	Trichoptera	Brachycentridae	20	40	316	50	96	99	73	130	100	230	0	6	6
Insecta	Trichoptera	Hydropsychidae	320	0	26	17	0	0	58	16	0	0	0	0	0
Insecta	Trichoptera	Hydroptilidae	0	0	184	0	384	33	0	0	0	0	0	0	0
Insecta	Trichoptera	Lepidostomatidae	0	60	0	0	576	165	131	16	20	126	0	0	0
Insecta	Trichoptera	Limnephilidae	20	0	26	267	0	0	29	49	0	0	0	0	0
Insecta	Trichoptera	Phryganeidae	20	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Trichoptera	Rhyacophilidae	460	1,580	447	317	264	132	523	717	500	524	358	142	251
Malacostraca	Amphipoda	Gammaridae	440	0	67	0	0	0	43	143	100	60	58	90	19
Malacostraca	Amphipoda	Hyalellidae	0	20	33	0	0	0	0	14	0	0	0	0	0

Table G.27: Supporting Measures Associated with Petite Ponar Benthic Invertebrate Community Sampling at Greenhills Creek Sedimentation Pond (RG_GHP), September 2022

Waterbody						Greenhil	ls Creek S	edimentat	ion Pond				
Biological Area Co	de						RG_	GHP					
Station ID		RG_C	3HP-1	RG_0	GHP-2	RG_0	SHP-3	RG_0	GHP-4	RG_0	GHP-5	RG_C	3HP-6
Measurement Loca	ition	Тор	Bottom	Тор	Bottom	Тор	Bottom	Тор	Bottom	Тор	Bottom	Тор	Bottom
Date Sampled		448	324	44	823	44	323	44	823	44	823	448	824
UTMs (NAD83, Zone	e 11U) - Easting	653	444	653	3650	653	458	653	3680	653	3480	653	8692
UTMs (NAD83, Zone	e 11U) - Northing	5546	6035	554	6034	554	5996	554	5997	554	5945	554	5952
Station Depth (m)		2	.4	1	.7	4	.7	3	.6	5	.5	4	.5
<b>Habitat Characteris</b>	stics												
Temperature (°C)		11.1	11	12.1	11.7	12.2	11.2	12.1	11.7	12	11.4	11.4	11.3
DO (mg/L)		9.5	9.2	9.6	9.2	9.3	9.8	9.3	9.2	9.1	9.5	9.2	9.2
DO (% sat)		87	84.1	89.9	85	86.8	89.4	87	85.2	85.3	87.5	84.4	83.9
рН		8.03	8.03	8.03	7.98	8.01	8.02	7.98	7.98	7.97	8.01	8.07	8.09
Specific Conductant	ecific Conductance (μS/cm)		1572	1567	1569	1568	1580	1571	1576	1568	1579	1571	1572
Secchi Depth (m)		2	.4	1	.7	2	.5	3	.6	2.	75	2.	37
Water Colour, Clarit	y		a bit of / black	murky bro	own/ black	murky bro	own/ black	murky bro	own/ black	little brow	n to clear		-
Benthic Invertebra	te Sampling ^a												
Number of Jars		•	1		3		1		1		1	,	1
	% Cobble	(	)	(	0	(	)		0	(	0	(	0
Substrate (in	% Gravel	(	)	(	0	(	)	(	0	(	0	(	0
sampler)	% Sand & finer	1	0	1	0	1	0	1	0	1	5	1	0
	% Organics	9	0	9	90	9	0	9	90	8	35	9	00
Macrophytes (in san	npler)	١	١	,	Ą	1	١	I	N	ı	N	1	٧
Algae (in sampler)	, , , ,		4	ı	V	ı	1	(	C	ı	N	S	iΡ
Comments		Better visi 19-Se	ibility than ep-22.				Foggy - po	or visibility					-

Notes: ID = identifier; UTMs = Universal Transverse Mercator Coordinates; NAD = North American Datum; °C = degrees Celsius; DO = dissolved oxygen; mg/L = milligrams per litre; % sat = percent saturation; µS/cm = microSiemens per centimetre; m = metre; - = no data/not recorded; N = none; A = abundant; C = common; S = sparse; cm = centimetre.

^a A Petite Ponar was used to collect samples from Greenhills Creek Sedimentation Pond. Each sample was comprised of n = 5 grabs from the top 2 cm of substrate.

Table G.28: Summary of Benthic Invertebrate Community Endpoints Associated with Petite Ponar Sampling in Greenhills Creek Sedimentation Pond, September 2022

Biological Area Code	Replicate	Density (No. org/m²)	Biomass (g/m²)	LPL Richness (No. of taxa)	Family Richness	%EPT	%Ephemeroptera	%Plecoptera	%Trichoptera	%Diptera	%Bivalvia	%Gastropoda
	1	1,728	6.9	18	10	4.6	4.6	0	0	59	12	5.6
	2	4,096	7.7	13	7.0	0.39	0.39	0	0	15	54	20
DC CHD	3	2,404	7.6	7.0	4.0	0	0	0	0	43	57	0
RG_GHP	4	2,060	9.1	12	6.0	2.3	2.3	0	0	18	72	1.2
	5	1,136	4.4	8.0	5.0	0	0	0	0	32	67	0.18
	6	1,732	5.8	9.0	5.0	0.12	0	0	0.12	37	62	0

Notes: No. org/m² = number of organisms per square metre; g/m² = grams per square metre; LPL = lowest practical level; % = percent; EPT = Ephemeroptera, Plecoptera, and Trichoptera.

Table G.29: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level (LPL) of Taxonomy, 2018 to 2022

	Ta	axon				20	)18					20	)19		
Higher Level	l Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	13,844	13,982	10,000	36,677	1,000	10,000	10,000	4,339	10,000	10,779	1,980	10,000
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	20	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	100	0	30	30	0	30	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	0	100	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	Pionidae	0	0	0	0	0	20	100	0	20	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	276	0	0	0	0	30	1,515	0	30	0	0
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0	0	100	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	100	0	0	30	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	100	0	103	100	9	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	30	0	100	0	0	0	0	0	146	0
Insecta	Diptera	Chironomidae	Ablabesmyia	1,000	4,684	177	103	0	20	218	1,309	100	212	0	100
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	0	0	0	0	40	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	1,000	100	1,000	413	10,000	2,789	145	1,515	115	212	1,000	451
Insecta	Diptera	Chironomidae	Cryptochironomus	100	276	0	30	100	0	0	0	0	0	9	0
Insecta	Diptera	Chironomidae	Dicrotendipes	0	100	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	40	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	100	100	0	30	30	0	40	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	100	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	245	276	2,366	3,650	1,000	10,000	145	138	2,008	1,695	1,000	3,677
Insecta	Diptera	Chironomidae	Psectrocladius	1,000	138	177	0	0	0	400	100	100	1,000	0	0
Insecta	Diptera	Chironomidae	Sergentia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	0	100	0	0	30	0	0	0	20	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	100	100	459	138	428	314	291	207	1,163	141	1,145	1,000
Insecta	Ephemeroptera	Baetidae	Callibaetis	207	1,000	1,000	1,000	30	293	241	1,000	155	30	9	344
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	0	215	0	0	0	0	0	100	9	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0	30	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	103	30	20	121	276	100	146	387	30	138
Malacostraca	Amphipoda	Hyalellidae	Hyalella	413	1,171	103	1,000	258	413	207	1,929	30	1,068	9	100

Table G.29: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level (LPL) of Taxonomy, 2018 to 2022

	Та	ixon				20	20					20	)21		
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	10,000	10,000	4,069	4,502	2,900	10,000	10,000	10,000	10,000	4,831	10,000	10,000
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	1,000	0	0	0	0	9
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	9	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	0	0	0	0	0	9
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0	0	0	0	0	0	9
Euchelicerata	Trombidiformes	Pionidae	Pionidae	139	0	0	100	0	9	0	0	0	0	0	9
Gastropoda	Basommatophora	Planorbidae	Gyraulus	139	13,160	0	139	30	0	1,000	10,000	9	0	0	30
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	277	0	0	0	0	0	0	100	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	277	0	0	0	0	0	139	0	0	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	0	30	20	9	0	0	20	225	182	190
Insecta	Diptera	Chironomidae	Ablabesmyia	1,000	416	20	146	0	0	208	416	0	20	0	0
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	40	0	9	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	292	3,602	1,502	1,000	1,768	1,000	416	277	100	0	1,000	199
Insecta	Diptera	Chironomidae	Cryptochironomus	0	0	0	0	0	9	100	416	100	139	43	20
Insecta	Diptera	Chironomidae	Dicrotendipes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	146	0	0	0	0	0	0	100	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	292	139	421	1,000	40	100	1,000	139	251	1,000	130	1,255
Insecta	Diptera	Chironomidae	Psectrocladius	1,024	0	100	1,607	40	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Sergentia	0	139	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	0	0	0	0	0	0	0	139	9	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	146	139	183	183	131	20	139	0	100	100	182	459
Insecta	Ephemeroptera	Baetidae	Callibaetis	0	1,801	139	208	0	9	416	1,000	0	312	0	9
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0	100	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0	0	0	9	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	0	0	0	0	0	0	100	100	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	139	0	0	9	0	9	0	0	0	0	9
Malacostraca	Amphipoda	Gammaridae	Gammarus	1,000	1,000	234	1,000	43	225	100	407	147	450	139	173
Malacostraca	Amphipoda	Hyalellidae	Hyalella	416	139	20	242	0	0	100	2,078	0	20	0	30

Table G.29: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level (LPL) of Taxonomy, 2018 to 2022

	Ta	axon				20	22		
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	208	2,208	1,360	1,480	1,000	1,082
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	40	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	Pionidae	20	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	100	1,000	0	20	2	0
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	8	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	4	0	2	30
Insecta	Diptera	Chironomidae	Ablabesmyia	171	320	0	100	0	2
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	447	100	1,000	106	114	103
Insecta	Diptera	Chironomidae	Cryptochironomus	20	100	100	20	30	49
Insecta	Diptera	Chironomidae	Dicrotendipes	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	8	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	20	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	106	48	160	20	141	229
Insecta	Diptera	Chironomidae	Psectrocladius	100	30	0	20	0	0
Insecta	Diptera	Chironomidae	Sergentia	8	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	49	48	0	8	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	146	0	20	131	100	225
Insecta	Ephemeroptera	Baetidae	Callibaetis	100	20	0	48	0	0
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	8	20	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	2
Malacostraca	Amphipoda	Gammaridae	Gammarus	192	100	4	132	4	6
Malacostraca	Amphipoda	Hyalellidae	Hyalella	100	336	0	8	0	0

Table G.30: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level of Taxonomy, 2018 to 2022

	Та	axon				20	18					20	19		
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	80.7	62.4	55.4	86.0	6.29	36.3	80.9	35.8	58.1	71.4	44.3	58.9
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	0.116	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0.308	0	0.0807	0.340	0	0.290	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	0	0.568	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	Pionidae	0	0	0	0	0	0.116	0.580	0	0.189	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	0	1.23	0	0	0	0	0.290	12.5	0	0.228	0	0
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0	0	0.568	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	0.402	0	0	0.0807	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0.510	0	0.870	0.568	0.0943	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	0.306	0	0.680	0	0	0	0	0	3.28	0
Insecta	Diptera	Chironomidae	Ablabesmyia	3.34	20.9	1.57	0.242	0	0.117	1.84	10.8	0.579	1.40	0	0.542
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	0	0	0	0	0.306	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	5.72	0.308	8.78	0.969	75.1	18.7	1.22	12.5	1.25	1.40	12.5	3.52
Insecta	Diptera	Chironomidae	Cryptochironomus	0.477	1.23	0	0.0807	0.689	0	0	0	0	0	0.193	0
Insecta	Diptera	Chironomidae	Dicrotendipes	0	0.308	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0.306	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0.477	0.308	0	0.0807	0.345	0	0.306	0	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0.308	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	1.43	1.23	21.0	8.56	8.45	36.9	1.22	1.14	22.0	11.2	12.9	28.7
Insecta	Diptera	Chironomidae	Psectrocladius	3.34	0.615	1.57	0	0	0	3.37	0.568	0.868	3.51	0	0
Insecta	Diptera	Chironomidae	Sergentia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	0	0.308	0	0	0.345	0	0	0	0.193	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	0.477	0.308	4.08	0.323	4.22	2.11	2.45	1.70	12.7	0.936	25.6	4.06
Insecta	Ephemeroptera	Baetidae	Callibaetis	1.20	4.00	5.50	1.29	0.340	1.97	2.03	6.25	1.70	0.228	0.193	2.69
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	0	0.961	0	0	0	0	0	0.568	0.0943	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0	0	0	0.283	0	0	0
Malacostraca	Amphipoda	Gammaridae	Gammarus	0	0	0.917	0.0807	0.170	0.810	2.32	0.568	1.60	2.57	0.771	1.08
Malacostraca	Amphipoda	Hyalellidae	Hyalella	2.41	5.23	0.917	2.26	2.55	2.78	1.74	15.9	0.377	7.07	0.193	0.538

Table G.30: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level of Taxonomy, 2018 to 2022

	Та	ixon				20	20					20	)21		
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	65.0	22.3	61.0	48.1	58.3	83.7	70.5	41.1	89.0	70.8	85.2	74.3
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	0	0	0	0	0	0	4.90	0	0	0	0	0.0926
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0	0	0	0.145	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0	0	0	0	0	0	0.0926
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0	0	0	0	0	0	0.0926
Euchelicerata	Trombidiformes	Pionidae	Pionidae	1.03	0	0	0.741	0	0.123	0	0	0	0	0	0.0926
Gastropoda	Basommatophora	Planorbidae	Gyraulus	1.03	50.5	0	1.48	0.522	0	4.90	39.0	0.145	0	0	0.278
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	2.06	0	0	0	0	0	0	0.293	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	2.06	0	0	0	0	0	1.23	0	0	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	0	0.370	0.348	0.123	0	0	0.290	3.30	2.29	2.04
Insecta	Diptera	Chironomidae	Ablabesmyia	5.44	1.60	0.274	1.56	0	0	1.84	1.76	0	0.254	0	0
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	0.549	0	0.188	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	2.18	13.8	22.5	8.59	35.5	11.3	3.68	1.17	1.45	0	6.31	2.13
Insecta	Diptera	Chironomidae	Cryptochironomus	0	0	0	0	0	0.125	0.613	1.76	1.16	2.03	0.544	0.185
Insecta	Diptera	Chironomidae	Dicrotendipes	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	1.09	0	0	0	0	0	0	0.293	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	2.18	0.532	6.31	6.64	0.751	0.996	4.90	0.587	4.21	11.4	1.63	13.4
Insecta	Diptera	Chironomidae	Psectrocladius	7.62	0	0.823	17.2	0.751	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Sergentia	0	0.532	0	0	0	0	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	0	0	0	0	0	0	0	0.587	0.145	0	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	1.09	0.532	2.74	1.95	2.63	0.249	1.23	0	0.871	0.761	2.29	4.91
Insecta	Ephemeroptera	Baetidae	Callibaetis	0	6.91	2.08	2.22	0	0.123	3.68	2.64	0	4.57	0	0.0926
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0	0.613	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0	0	0	0.145	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	0	0	0	0	0	0	0.613	0.330	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0.532	0	0	0.174	0	0.0766	0	0	0	0	0.0926
Malacostraca	Amphipoda	Gammaridae	Gammarus	6.19	2.13	3.50	8.52	0.870	3.21	0.613	1.72	2.47	6.60	1.74	1.85
Malacostraca	Amphipoda	Hyalellidae	Hyalella	3.09	0.532	0.259	2.59	0	0	0.613	8.80	0	0.254	0	0.278

Table G.30: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Lowest Practical Level of Taxonomy, 2018 to 2022

	Ta	axon				20	22		
Higher Level	Classification	Family	Lowest Practical Level Identification	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	Pisidium	12.0	53.9	56.6	71.8	67.1	62.5
Clitellata	Hirudinida	Erpobdellidae	Erpobdellidae	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	Tubificinae	2.31	0	0	0	0	0
Clitellata	-	Enchytraeidae	Enchytraeidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	Lebertia	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	Mideopsis	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	Pionidae	0.926	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	Gyraulus	5.56	19.9	0	1.17	0.176	0
Insecta	Coleoptera	Dytiscidae	Hydroporus	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	Haliplus	0.463	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	Bezzia	0	0	0	0	0	0
Insecta	Diptera	Chaoboridae	Chaoboridae	0	0	0.166	0	0.176	1.96
Insecta	Diptera	Chironomidae	Ablabesmyia	9.88	7.81	0	3.57	0	0.117
Insecta	Diptera	Chironomidae	Apsectrotanypus	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Chironomus	25.9	1.95	32.1	5.16	10.0	5.97
Insecta	Diptera	Chironomidae	Cryptochironomus	1.41	1.56	3.33	0.794	2.90	2.81
Insecta	Diptera	Chironomidae	Dicrotendipes	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Pagastia	0.470	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paramerina	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Paratanytarsus	0	0.391	0	0	0	0
Insecta	Diptera	Chironomidae	Polypedilum	0	0	0	0	0	0
Insecta	Diptera	Chironomidae	Procladius	6.11	1.17	6.66	0.794	12.4	13.2
Insecta	Diptera	Chironomidae	Psectrocladius	3.29	0.781	0	0.794	0	0
Insecta	Diptera	Chironomidae	Sergentia	0.470	0	0	0	0	0
Insecta	Diptera	Chironomidae	Stictochironomus	2.82	1.17	0	0.397	0	0
Insecta	Diptera	Chironomidae	Tanytarsus	8.47	0	0.998	6.35	6.87	13.0
Insecta	Ephemeroptera	Baetidae	Callibaetis	4.63	0.391	0	2.33	0	0
Insecta	Ephemeroptera	Caenidae	Caenis	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	Corixidae	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	Coenagrionidae	0.463	0.391	0	0	0	0
Insecta	Trichoptera	Phryganeidae	Phryganeidae	0	0	0	0	0	0.115
Malacostraca	Amphipoda	Gammaridae	Gammarus	11.1	2.34	0.166	6.41	0.352	0.346
Malacostraca	Amphipoda	Hyalellidae	Hyalella	3.70	8.20	0	0.388	0	0

Table G.31: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	18					20	)19		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	13,844	13,982	10,000	36,677	1,000	10,000	10,000	4,339	10,000	10,779	1,980	10,000
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	20	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	100	0	30	30	0	30	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	0	100	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	0	0	0	0	0	20	100	0	20	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	276	0	0	0	0	30	1,515	0	30	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	100	0	0	0	0
Insecta	Coleoptera	Haliplidae	100	0	0	30	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	100	0	103	100	9	0	0	0
Insecta	Diptera	Chaoboridae	0	0	30	0	100	0	0	0	0	0	146	0
Insecta	Diptera	Chironomidae	2,617	10,000	4,167	4,374	10,000	10,000	1,309	3,237	3,435	2,789	2,290	4,718
Insecta	Ephemeroptera	Baetidae	207	1,000	1,000	1,000	30	293	241	1,000	155	30	9	344
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	0	215	0	0	0	0	0	100	9	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0	0	0	0	0	0	0	30	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	103	30	20	121	276	100	146	387	30	138
Malacostraca	Amphipoda	Hyalellidae	413	1,171	103	1,000	258	413	207	1,929	30	1,068	9	100

Table G.31: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	20					20	)21		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	10,000	10,000	4,069	4,502	2,900	10,000	10,000	10,000	10,000	4,831	10,000	10,000
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	1,000	0	0	0	0	9
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	0	0	9	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	9
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	9
Euchelicerata	Trombidiformes	Pionidae	139	0	0	100	0	9	0	0	0	0	0	9
Gastropoda	Basommatophora	Planorbidae	139	13,160	0	139	30	0	1,000	10,000	9	0	0	30
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	277	0	0	0	0	0	0	100	0	0	0	0
Insecta	Diptera	Ceratopogonidae	277	0	0	0	0	0	139	0	0	0	0	0
Insecta	Diptera	Chaoboridae	0	0	0	30	20	9	0	0	20	225	182	190
Insecta	Diptera	Chironomidae	2,632	4,433	2,216	3,359	1,983	1,000	1,385	1,455	468	1,000	1,000	1,931
Insecta	Ephemeroptera	Baetidae	0	1,801	139	208	0	9	416	1,000	0	312	0	9
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0	100	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0	0	0	9	0	0	0
Insecta	Odonata	Coenagrionidae	0	0	0	0	0	0	100	100	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	139	0	0	9	0	9	0	0	0	0	9
Malacostraca	Amphipoda	Gammaridae	1,000	1,000	234	1,000	43	225	100	407	147	450	139	173
Malacostraca	Amphipoda	Hyalellidae	416	139	20	242	0	0	100	2,078	0	20	0	30

Table G.31: Densities (No./m²) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	22		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	208	2,208	1,360	1,480	1,000	1,082
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	40	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	20	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	100	1,000	0	20	2	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	8	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0
Insecta	Diptera	Chaoboridae	0	0	4	0	2	30
Insecta	Diptera	Chironomidae	1,016	1,000	1,036	368	366	1,000
Insecta	Ephemeroptera	Baetidae	100	20	0	48	0	0
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	8	20	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0	0	0	0	2
Malacostraca	Amphipoda	Gammaridae	192	100	4	132	4	6
Malacostraca	Amphipoda	Hyalellidae	100	336	0	8	0	0

Table G.32: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	18					20	)19		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	80.7	62.4	55.4	86.0	6.29	36.3	80.9	35.8	58.1	71.4	44.3	58.9
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	0.116	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0.308	0	0.0807	0.340	0	0.290	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	0	0.568	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	0	0	0	0	0	0.116	0.580	0	0.189	0	0	0
Gastropoda	Basommatophora	Planorbidae	0	1.23	0	0	0	0	0.290	12.5	0	0.228	0	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0.568	0	0	0	0
Insecta	Coleoptera	Haliplidae	0.402	0	0	0.0807	0	0	0	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0.510	0	0.870	0.568	0.0943	0	0	0
Insecta	Diptera	Chaoboridae	0	0	0.306	0	0.680	0	0	0	0	0	3.28	0
Insecta	Diptera	Chironomidae	15.3	25.8	37.0	10.2	89.1	57.9	11.0	26.7	37.6	18.5	51.2	36.8
Insecta	Ephemeroptera	Baetidae	1.20	4.00	5.50	1.29	0.340	1.97	2.03	6.25	1.70	0.228	0.193	2.69
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	0	0.961	0	0	0	0	0	0.568	0.0943	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0	0	0	0	0	0	0	0.283	0	0	0
Malacostraca	Amphipoda	Gammaridae	0	0	0.917	0.0807	0.170	0.810	2.32	0.568	1.60	2.57	0.771	1.08
Malacostraca	Amphipoda	Hyalellidae	2.41	5.23	0.917	2.26	2.55	2.78	1.74	15.9	0.377	7.07	0.193	0.538

Table G.32: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	20					20	)21		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	65.0	22.3	61.0	48.1	58.3	83.7	70.5	41.1	89.0	70.8	85.2	74.3
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	0	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	0	0	0	0	0	0	4.90	0	0	0	0	0.0926
Clitellata	-	Enchytraeidae	0	0	0	0	0	0	0	0	0.145	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0	0	0	0	0	0	0.0926
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0	0	0	0	0	0	0.0926
Euchelicerata	Trombidiformes	Pionidae	1.03	0	0	0.741	0	0.123	0	0	0	0	0	0.0926
Gastropoda	Basommatophora	Planorbidae	1.03	50.5	0	1.48	0.522	0	4.90	39.0	0.145	0	0	0.278
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	2.06	0	0	0	0	0	0	0.293	0	0	0	0
Insecta	Diptera	Ceratopogonidae	2.06	0	0	0	0	0	1.23	0	0	0	0	0
Insecta	Diptera	Chaoboridae	0	0	0	0.370	0.348	0.123	0	0	0.290	3.30	2.29	2.04
Insecta	Diptera	Chironomidae	19.6	17.0	33.2	35.9	39.8	12.7	12.3	6.16	7.84	14.5	10.8	20.6
Insecta	Ephemeroptera	Baetidae	0	6.91	2.08	2.22	0	0.123	3.68	2.64	0	4.57	0	0.0926
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0	0.613	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0	0	0	0.145	0	0	0
Insecta	Odonata	Coenagrionidae	0	0	0	0	0	0	0.613	0.330	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0.532	0	0	0.174	0	0.0766	0	0	0	0	0.0926
Malacostraca	Amphipoda	Gammaridae	6.19	2.13	3.50	8.52	0.870	3.21	0.613	1.72	2.47	6.60	1.74	1.85
Malacostraca	Amphipoda	Hyalellidae	3.09	0.532	0.259	2.59	0	0	0.613	8.80	0	0.254	0	0.278

Table G.32: Relative Abundance (Percent[%]) of Benthic Invertebrate Taxa in Samples from Greenhills Creek Sedimentation Pond Based on the Family Level of Taxonomy, 2018 to 2022

	Taxon				20	22		
Higher Level	Classification	Family	RG_GHP-1	RG_GHP-2	RG_GHP-3	RG_GHP-4	RG_GHP-5	RG_GHP-6
Bivalvia	Veneroida	Pisidiidae	12.0	53.9	56.6	71.8	67.1	62.5
Clitellata	Hirudinida	Erpobdellidae	0	0	0	0	0	0
Clitellata	Tubificida	Naididae	2.31	0	0	0	0	0
Clitellata	-	Enchytraeidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Lebertiidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Mideopsidae	0	0	0	0	0	0
Euchelicerata	Trombidiformes	Pionidae	0.926	0	0	0	0	0
Gastropoda	Basommatophora	Planorbidae	5.56	19.9	0	1.17	0.176	0
Insecta	Coleoptera	Dytiscidae	0	0	0	0	0	0
Insecta	Coleoptera	Haliplidae	0.463	0	0	0	0	0
Insecta	Diptera	Ceratopogonidae	0	0	0	0	0	0
Insecta	Diptera	Chaoboridae	0	0	0.166	0	0.176	1.96
Insecta	Diptera	Chironomidae	58.8	14.8	43.1	17.9	32.2	35.1
Insecta	Ephemeroptera	Baetidae	4.63	0.391	0	2.33	0	0
Insecta	Ephemeroptera	Caenidae	0	0	0	0	0	0
Insecta	Hemiptera	Corixidae	0	0	0	0	0	0
Insecta	Odonata	Coenagrionidae	0.463	0.391	0	0	0	0
Insecta	Trichoptera	Phryganeidae	0	0	0	0	0	0.115
Malacostraca	Amphipoda	Gammaridae	11.1	2.34	0.166	6.41	0.352	0.346
Malacostraca	Amphipoda	Hyalellidae	3.70	8.20	0	0.388	0	0

# APPENDIX H BIOLOGICAL TRIGGERS

#### **BIOLOGICAL TRIGGERS APPENDIX H**

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# **H1 INTRODUCTION**

# **H1.1** Overview of Biological Triggers

Biological triggers for potential monitoring and management action are required as part of Teck Coal Limited's (Teck's) Adaptive Management Plan (AMP; Teck 2018, 2021). Generally, triggers are intended as a simple way to identify and communicate potentially unexpected monitoring results that may require management action. Additionally, information obtained from the analysis of biological triggers may lead to responses under the AMP response framework, if necessary, and as such would be reported within the annual AMP report.

Draft biological triggers were developed in consultation with the Environmental Monitoring Committee (EMC) for a subset of biological monitoring endpoints that are effective indicators of changes at the ecosystem level. Development of the triggers was completed under Management Question (MQ) 5 of the 2018 AMP (Teck 2018). The biological triggers were finalized in 2021, prior to the December 15, 2021 AMP update (Teck 2021). The methods applied in this report reflect the finalized biological triggers (Teck 2021). However, it is important to note that the process and/or biological triggers may be adjusted over time, given that the purpose of the biological triggers is to reflect not only changes in the Elk River watershed, but also the current state of knowledge for the area.

The finalized biological triggers include three measurement endpoints (Teck 2021):

- percent Ephemeroptera, Plecoptera, and Trichoptera (%EPT);
- selenium concentrations in benthic invertebrate tissues; and
- selenium concentrations in westslope cutthroat trout (WCT; *Oncorhynchus clarkia lewisi*) muscle.

The biological trigger endpoint for %EPT is based on three-minute (Canadian Aquatic Biomonitoring Network [CABIN] protocol) kicks (i.e., timed kicks) and typically three replicates per location per sampling event. For selenium concentrations in benthic invertebrate tissues, there are generally several replicates collected per location per sampling event, and each replicate is a composite-taxa tissue sample.¹ For WCT, the biological trigger can be applied to selenium concentrations in individual muscle tissue samples.

¹ Composite-taxa samples containing annelids were excluded from the biological triggers analysis for selenium concentrations in benthic invertebrate tissues.

Evaluation of these three biological trigger endpoints is complementary to the fulsome evaluation of biological endpoints that is integrated into the Regional Aquatic Effects Monitoring Program (RAEMP) and Local Aquatic Effects Monitoring Program (LAEMP) reports, as appropriate. The more fulsome evaluation of biological endpoints in the overarching monitoring program reports is used to answer specific study questions through the consideration of not only the endpoints used in the biological trigger evaluation, but also a full suite of additional biological, chemical, and physical endpoints. Biological triggers do not provide information on cause and effect or report on trends. Instead, the biological triggers act to flag areas for further evaluation; these evaluations would then take place under existing monitoring programs, through the development of supporting studies, or through the response framework, as necessary.

The 2022 Greenhills Creek Aquatic Effects Assessment and Monitoring Program (GC LAEMP) represents the third time that biological triggers have been evaluated and reported (i.e., implemented) as part of focused monitoring on Lower Greenhills Creek (Minnow 2021a, 2022a). The year 2022 is also the second year during which biological triggers were applied to Upper Greenhills Creek. To date, biological triggers have not been applied to Gardine Creek.

# H1.2 Application of Biological Triggers to Greenhills Creek

As outlined in Section H1.1, analyses for biological triggers are meant to be complementary to other analyses completed to address the study questions for the GC LAEMP, as well as analyses presented in the other LAEMP and RAEMP reports. The biological trigger analyses for 2022 included two of the three measurement endpoints: %EPT and selenium concentrations in benthic invertebrate tissues. No WCT tissue chemistry sampling was completed within the Greenhills Creek watershed in 2022 (i.e., as part of planned monitoring or in response to incidental mortalities) in an effort to minimize fish handling stress and potential risks to WCT. Therefore, biological triggers pertaining to selenium concentrations in WCT muscle could not be evaluated.

For Upper Greenhills Creek, biological triggers for %EPT and selenium concentrations in composite-taxa benthic invertebrate tissue samples were assessed based on the 2022 data for one location, RG_GHNF.² This biological monitoring area is located upstream from the current (i.e., since November 2022) antiscalant addition system (AAS) location. For the purposes of the biological triggers analysis, predictions were based on projected water

² Three timed kick samples were collected from RG_GHNF, in addition to the area-based kick samples typical of the GC LAEMP, to support comparisons to biological triggers for %EPT (Minnow 2022b).

quality rather than measured water quality. The assessment is designed in this manner so the triggers should detect biological results that were unexpected, regardless of whether those results are due to unexpected water quality or due to unexpected relationships between water quality and biological endpoints. Water quality projections for routine water quality monitoring station GH_HWGH_BRB, which is located on Upper Greenhills Creek, upstream from the confluence with Gardine Creek but downstream from the current AAS location, were used.³

The use of water quality projections from GH_HWGH_BRB represents a deviation from the 2022 study design (Minnow 2022b). The study team planned to pair RG_GHNF with projections for GH_USAAS, which, like RG_GHNF, is located upstream from the current (i.e., since November 2022) AAS location on Upper Greenhills Creek. However, no projections were available for GH_USAAS. Consequently, biological data for RG_GHNF were paired with projections from GH_HWGH_BRB, consistent with the 2021 GC LAEMP report (Minnow 2022a).

For Lower Greenhills Creek, the evaluations of biological triggers for %EPT and selenium concentrations in benthic invertebrate tissues were based on water quality projections for routine water quality monitoring station GH GH1.4 Station GH GH1 is the permitted water quality station downstream from the Greenhills Creek Sedimentation Pond and the Stilling Basin V-notch but upstream from the historical (i.e., October 2017 to August 2022) AAS location. This station was the only location on Lower Greenhills Creek that had water quality projections. The projections for GH GH1 were used in conjunction with benthic invertebrate community and tissue chemistry data from RG GHCKD and benthic invertebrate tissue chemistry data from RG GHBP. Monitoring area RG GHCKD is a long-term monitoring location that has been evaluated as part of the RAEMP since 2012 (Minnow 2014, 2020a, 2021b) and is located approximately 285 metres (m) downstream from routine water quality monitoring station GH GH1. Monitoring area RG GHBP is co-located with RG GHCKD and is routinely monitored as part of the GC LAEMP (Minnow 2018, 2019, 2020b, 2021a, 2022a).5

Other monitoring areas on Greenhills and Gardine creeks were not used to evaluate biological triggers because nearby water quality projections were unavailable and/or the methods for

⁵ The 2022 benthic invertebrate community data for RG_GHCKD was used because the sampling method for RG_GHCKD is consistent with the method that underlies the %EPT biological trigger (i.e., timed kicks characteristic of CABIN sampling). Benthic invertebrate community sampling at RG_GHBP is area-based and is therefore inconsistent with the method underlying the %EPT biological trigger.



³ The projections for GH_HWGH_BRB are from the 2022 Implementation Plan Adjustment (IPA) (Teck 2022).

⁴ The projections for GH GH1 are from the 2022 (nickel) or 2019 (all other constituents) IPA (Teck 2019).

assessing benthic invertebrate communities were incompatible with the methods underlying the %EPT predictions. Due to excessive calcite formation in Greenhills and Gardine creeks and a focus on invertebrate densities and biomass in the system, a modified CABIN method is used (i.e., the sampler kicks within a fixed area of 1/3 square metres [m²], rather than collecting samples using timed kicks).⁶ Additionally, the greater within-area variability that is typical of fixed-area samples relative to travelling samples was not accounted for in the habitat model used to generate the predictions for %EPT. By using timed kick data for RG_GHNF and RG_GHCKD, it was possible to make a more accurate assessment of the %EPT biological trigger, which relies on comparisons to the habitat-adjusted normal range for %EPT and expectations based on the predicted Aquatic Data Integration Tool (ADIT) score. Although data for monitoring areas other than RG_GHNF and RG_GHCKD/RG_GHBP could not been included in in the evaluations of biological triggers for %EPT and selenium concentrations in benthic invertebrate tissues, data for these areas were assessed in detail through other aspects of the 2022 monitoring program report.

⁶ For further details regarding the benthic invertebrate community sampling completed as part of the GC LAEMP, see Section 2.4.1 of the main report.

# **H2 METHODS**

# H2.1 Percent Ephemeroptera, Plecoptera, and Trichoptera

Proportions of EPT in the timed kick and sweep benthic invertebrate community samples collected from RG GHNF (n = 3) and RG GHCKD (n = 3) in 2022 were compared to the lower limits (i.e., the 2.5th percentiles) of site-specific habitat-adjusted normal ranges and expectations based on the predicted ADIT scores for these locations. The process for deriving habitat-adjusted normal ranges is described in detail in Appendix J of the 2020 RAEMP report and based on consideration of more than 30 habitat, Geographic Information Systems (GIS), and cover variables (Minnow 2020a). Predicted ADIT scores correspond to potential effects on benthic invertebrate community endpoints, based on relationships between water quality projections (for nitrate, sulphate, and cadmium) and invertebrate toxicity endpoints originally developed for the Elk Valley Water Quality Plan (EVWQP; Teck 2014). A predicted ADIT score of 3 corresponds to 50 percent (%) or greater reduction in reproduction of the water flea Ceriodaphnia dubia, 2 corresponds to a 20 to 50% reduction, 1 corresponds to a 10 to 20% reduction, and 0 corresponds to a reduction of 10% or less. Once %EPT is measured, the measured results are converted to a measured ADIT score in relation to the habitat adjusted normal range as follows:

- an ADIT score of 0 corresponds to expected %EPT greater than or equal to (≥) the 10th
  percentile of the habitat adjusted normal range;
- an ADIT score of 1 corresponds to expected %EPT between the 10th percentile and the 2.5th percentile of the habitat-adjusted normal range (and is therefore identical in application to the lower limit of normal range);
- an ADIT score of 2 corresponds to expected %EPT between the 2.5th percentile and half of the 2.5th percentile of the habitat-adjusted normal range; and
- an ADIT score of 3 corresponds to expected %EPT less than or equal to (≤) half of the 2.5th percentile and ≥ 0.

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

#### H2.2 Benthic Invertebrate Tissue Selenium

Selenium concentrations in composite-taxa benthic invertebrate tissue samples collected from RG_GHNF (Upper Greenhills Creek) and RG_GHCKD and RG_GHBP (Lower Greenhills Creek) in 2022 were compared to the regional reference area normal range

and expectations based on the lotic bioaccumulation model that was updated by Golder Associates (Golder) in 2020 (Golder 2014, 2020). The reference area normal range represents the 2.5th and 97.5th percentiles of the reference area data set for selenium concentrations in benthic invertebrate tissues (Minnow 2020a). In the case of biological triggers, the upper boundary of the reference area normal range is the primary point of comparison (i.e., "Is the concentration within or above the regional reference area normal range?").

Expectations associated with the bioaccumulation model focus on the upper limit of the 95% prediction interval for the water to benthic invertebrate tissue bioaccumulation model. The model was originally developed for the EVWQP (Golder 2014; Teck 2014) and was updated in 2020 as follows (Golder 2020):

$$log_{10}[Se]_{benthic\ invertebrate} = 0.720 + 0.071 \times log_{10}[Se]_{aqueous}$$

Prediction intervals were estimated for selenium concentrations in individual replicate samples. Benthic invertebrate tissue selenium data collected from RG_GHBP in February 2022 were included in the biological trigger analysis, although normal range information is based on fall (September) sampling. Although effects benchmarks are not part of the trigger for selenium concentrations in benthic invertebrate tissues, they are relevant for interpreting potential biological significance and responses. Consequently, the EVWQP Level 1, 2 and 3 Benchmarks for the most sensitive receptor (juvenile fish via dietary exposure; 11, 18, and 26 milligrams per kilogram dry weight [mg/kg dw], respectively) were included in relevant plots.

# H3 RESULTS

# H3.1 Percent Ephemeroptera, Plecoptera, and Trichoptera

For the benthic invertebrate community samples collected from RG_GHNF and RG_GHCKD (three samples per area) in 2022, %EPT was consistently lower than habitat-adjusted normal ranges and predicted ADIT values (Appendix Figure H.1; Appendix Table H.1). The only exception was one sample from RG_GHNF (i.e., RG_GHNF-1) that had a %EPT value (61%) that was less than the 2.5th percentile of the habitat-adjusted normal range but higher than the predicted ADIT value (41%) (Appendix Figure H.1; Appendix Table H.1). Overall, it can be concluded that biological triggers were exceeded at both RG_GHNF and RG_GHCKD on Greenhills Creek in 2022.

#### H3.2 Benthic Invertebrate Tissue Selenium

None of the composite-taxa benthic invertebrate tissue selenium samples collected from Upper Greenhills Creek in 2022 exceeded the biological trigger, but all of the annelid-free composite-taxa benthic invertebrate tissue selenium samples from Lower Greenhills Creek (i.e., n = 3 at RG_GHBP in February 2022 and n = 1 each at RG_GHCKD and RG_GHBP in September 2022) exceeded the biological trigger (Appendix Figure H.2; Appendix Table H.2). The high frequency and magnitude of exceedances for Lower Greenhills Creek are likely attributed to sampling locations being downstream from the Greenhills Creek Sedimentation Pond discharge. Processes within the pond environment can enhance formation of organoselenium species and there can be elevated bioavailable selenium in lotic habitats immediately downstream (Golder 2021). As indicated in the main report, combined concentrations of dimethylselenoxide and methylseleninic acid were highest in the Greenhills Creek Sedimentation Pond and downstream at RG_GHBP in 2022 and likely contributed to enhanced selenium bioaccumulation (ADEPT et al. 2023).

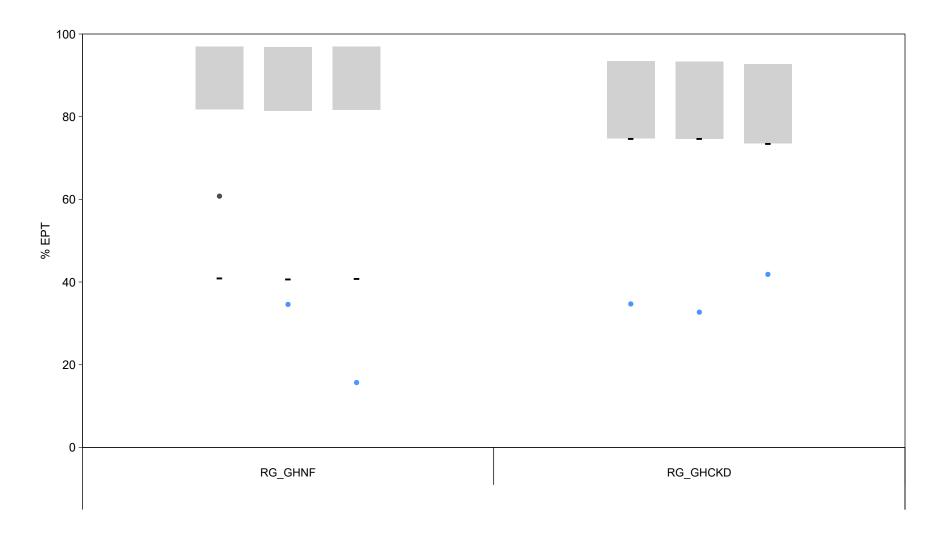


Figure H.1: Measured Proportions of Ephemeroptera, Plecoptera, and Trichoptera Combined (%EPT) Relative to Predictions, Upper (RG_GHNF) and Lower (RG_GHCKD) Greenhills Creek, 2022

Notes: Grey shading represents the habitat-adjusted normal range for each replicate. Black bars indicate the lower limit of the predicted Aquatic Data Integration Tool (ADIT) score for the location. Blue dots represent values exceeding the biological trigger (i.e., values below the 2.5th percentile of the habitat-adjusted normal range and the lower limit of the predicted ADIT score).

Table H.1: Biological Trigger Analysis for Combined Proportions of Ephemeroptera, Plecoptera, and Trichoptera (%EPT) in Benthic Invertebrate Community Samples from Greenhills Creek, September 2022

Watercourse	Biological Monitoring Area	Replicate	Reported Value	ADIT Value	Lower 2.5 th Percentile of the Habitat Adjusted Normal Range
Lloner Creenbille		1	60.8	40.9	81.8
Upper Greenhills Creek	RG_GHNF	2	34.6	40.7	81.4
Cleek		3	15.7	40.8	81.6
1 0 1		1	34.7	74.7	74.7
Lower Greenhills Creek	RG_GHCKD	2	32.7	74.7	74.7
Creek		3	41.9	73.5	73.5

Shaded cells signify individual replicates that were associated with a biological trigger (i.e., %EPT was lower than both the ADIT value [as based on predicted water quality] and the lower 2.5th percentile of habitat-adjusted normal range).

Note: ADIT = Aquatic Data Integration Tool.

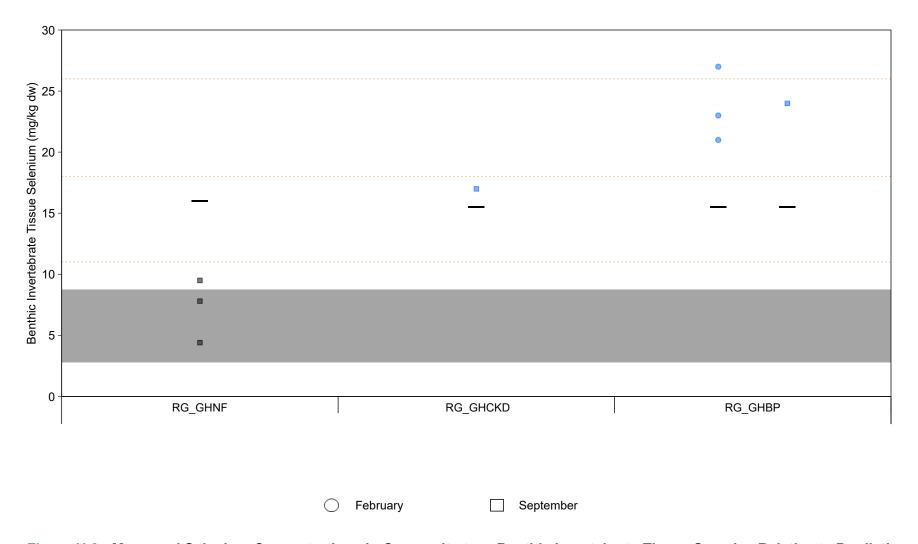


Figure H.2: Measured Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples Relative to Predictions for Upper (RG_GHNF) and Lower (RG_GHCKD and RG_GHBP) Greenhills Creek, 2022

Notes: Grey shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) from the Regional Aquatic Effects Monitoring Program (RAEMP). Black bars indicate the upper 95% prediction interval of the bioaccumulation model. Blue dots or squares represent values exceeding the biological trigger (i.e., values above the 97.5th percentile of the reference area normal range and above upper 95% prediction interval). Dotted lines indicate Elk Valley Water Quality Plan (EVWQP) benchmarks (11, 18, and 26 milligrams per kilogram dry weight [mg/kg dw], respectively) for dietary effects to juvenile fish.

Table H.2: Biological Trigger Analysis for Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples from Greenhills Creek, 2022 ^a

			Predicted	Benth	ic Invertebrate Tissue Selen	ium
Watercourse	Biological Monitoring Area	Date	Selenium Water Concentration (mg/L)	Upper 95% Prediction Limit (mg/kg dw)	Upper 97.5 th Percentile of Normal Range (mg/kg dw)	Reported Concentration (mg/kg dw)
Linnar Creanbille		9-Sep-22	327	16.0	8.7	4.4
Upper Greenhills Creek	RG_GHNF	10-Sep-22	327	16.0	8.7	9.5
Oreck		10-3ep-22	327	16.0	8.7	7.8
	RG_GHCKD	15-Sep-22	215	15.5	8.7	17.0
l On			215	15.5	8.7	23.0
Lower Greenhills Creek	RG GHBP	28-Feb-22	215	15.5	8.7	27.0
Oleek	KG_GHBP		215	15.5	8.7	21.0
		12-Sep-22	215	15.5	8.7	24.0

Shaded cells signify individual replicates that were associated with a biological trigger (i.e. higher than both the upper 95% prediction limit [as based on predicted water quality] and the upper 97.5th percentile of the normal range).

Notes: mg/L = milligrams per litre; % = percent; mg/kg dw = milligrams per kilogram dry weight.

^a Annelid-containing samples (including composite-taxa samples with annelids) were excluded from the assessment.

# **H4 SUMMARY**

Biological triggers for %EPT were exceeded at Upper and Lower Greenhills Creek in 2022, whereas biological triggers for selenium concentrations in benthic invertebrate tissues were only exceeded within Lower Greenhills Creek. Specifically, the biological trigger for %EPT was exceeded in two and three of the replicate samples (total n = 3 per area) from RG_GHNF and RG_GHCKD, respectively. Selenium concentrations in all five composite-taxa benthic invertebrate tissue chemistry samples collected from Lower Greenhills Creek in 2022 exceeded the biological trigger, and this was likely attributed to enhanced generation of organoselenium species upstream in the Greenhills Creek Sedimentation Pond.

Overall, current biological triggers were sufficient to identify monitoring areas where biological responses are occurring, and no additional triggers are recommended at this time. The results of the biological trigger evaluations are generally consistent with the findings of the overarching GC LAEMP. However, uncertainty remains around the cause of the observed %EPT response in two of the three samples from RG GHNF on Upper Greenhills Creek and each of the three samples from RG GHCKD on Lower Greenhills Creek. Efforts to resolve uncertainty around the combined and individual effects of water quality, habitat, and other mine-related stressors on benthic invertebrate communities in lotic habitats of the Elk River watershed are underway. Minnow Environmental Inc. (Minnow) is developing a predictive model for benthic invertebrate community endpoints. Additionally, monitoring, or potential responses will continue to be assessed through management Teck's adaptive management framework.

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# APPENDIX I BENTHIC INVERTEBRATE TISSUE CHEMISTRY

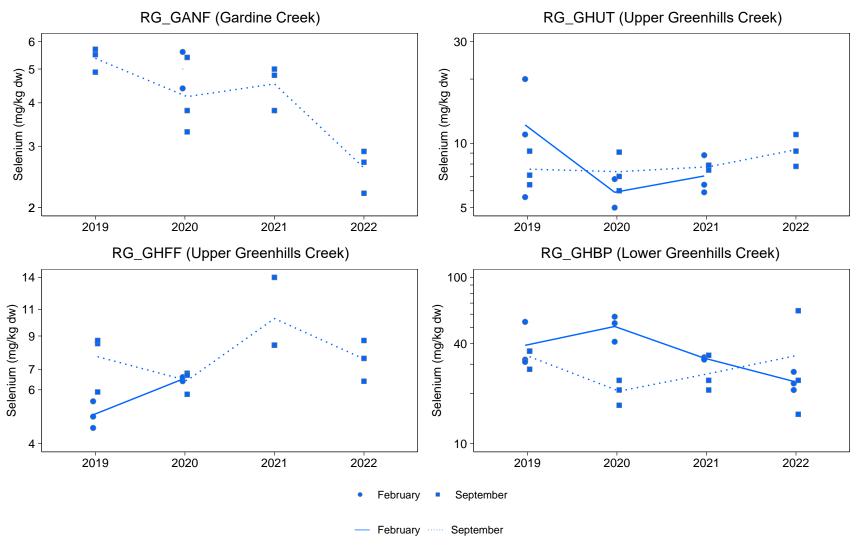


Figure I.1: Comparisons of Selenium Concentrations in Composite—taxa Benthic Invertebrate Tissue Samples Collected in February and September, Greenhills and Gardine Creeks, 2019 to 2022

Notes: Solid lines connect means. Y-axes were plotted on  $\log_{10}$ -transformed scale. Only areas that had both Feburary and September samples were included in the analyses.

Table I.1: Chemistry Data for Benthic Invertebrate Tissue Samples Collected from Greenhills and Gardine Creeks, February and September 2022

				Gardin	e Creek						Up	per Greenhills Cr	eek			
			RG_GAUT			RG_GANF			RG_GHUT			RG_GHNF			RG_GHDT	
Constituent	Units		Composite-taxa			Composite-taxa			Composite-taxa			Composite-taxa			Composite-taxa	
		RG_GAUT-1	RG_GAUT-3	RG_GAUT-5	RG_GANF-1	RG_GANF-3	RG_GANF-5	RG_GHUT-1	RG_GHUT-3	RG_GHUT-5	RG_GHNF-1	RG_GHNF-3	RG_GHNF-5	RG_GHDT-1	RG_GHDT-3	RG_GHDT-5
		14-Sep-22	14-Sep-22	14-Sep-22	13-Sep-22	13-Sep-22	13-Sep-22	15-Sep-22	15-Sep-22	15-Sep-22	09-Sep-22	10-Sep-22	10-Sep-22	16-Sep-22	16-Sep-22	16-Sep-22
% Moisture	%	84.3	77.4	81.4	77.6	79.1	75.3	83.3	83.8	83.4	83.8	83.9	84.9	78.2	80.5	82.1
Aluminum (Al)	mg/kg dw	12,497	21,316	11,064	3,197	3,193	4,057	4,068	3,984	5,446	1,692	1,337	3,922	2,782	1,986	3,631
Antimony (Sb)	mg/kg dw	0.379	0.759	0.405	0.113	0.123	0.134	0.153	0.145	0.188	0.095	0.085	0.139	0.110	0.104	0.136
Arsenic (As)	mg/kg dw	1.5	3.1	1.6	<0.431	0.741	0.860	0.898	1.1	0.957	0.630	0.56	1.2	0.910	1.0	1.1
Barium (Ba)	mg/kg dw	190	321	192	59	66	112	63	53	71	36	31	66	55	45	69
Boron (B)	mg/kg dw	13	23	11	3.1	3.0	3.8	3.2	2.7	3.9	1.3	1.4	3.0	3.3	2.6	4.5
Cadmium (Cd)	mg/kg dw	3.1	1.6	1.4	0.307	0.284	0.331	6.9	8.5	6.1	1.0	2.4	5.0	1.3	1.2	1.4
Calcium (Ca)	mg/kg dw	5,451	6,405	4,114	8,589	18,424	13,761	19,492	10,735	15,755	14,686	14,101	22,457	16,241	16,204	20,817
Chromium (Cr)	mg/kg dw	70	241	88	13	17	18	23	26	28	15	22	25	25	22	24
Cobalt (Co)	mg/kg dw	2.9	13	4.0	0.670	0.815	1.5	2.3	2.3	2.6	1.1	1.0	2.1	1.1	1.7	2.0
Copper (Cu)	mg/kg dw	25	35	28	16	16	19	19	18	27	7.5	24	14	20	21	21
Iron (Fe)	mg/kg dw	3,941	9,639	4,454	883	1,098	1,388	1,313	1,657	1,662	645	735	1,313	1,194	947	1,423
Lead (Pb)	mg/kg dw	2.2	5.4	2.4	0.772	0.551	0.705	1.5	1.4	1.8	0.559	0.614	1.3	0.905	0.745	1.3
Lithium (Li)	mg/kg dw	5.2	11	5.4	1.7	1.9	2.6	2.5	2.8	2.6	0.931	1.7	2.6	1.9	1.8	2.7
Magnesium (Mg)	mg/kg dw	2,182	2,987	2,081	1,798	2,761	2,516	2,310	2,432	2,725	1,323	2,608	2,768	2,814	2,433	2,678
Manganese (Mn)	mg/kg dw	117	169	127	36	30	41	63	75	62	23	46	74	55	49	62
Mercury (Hg)	mg/kg dw	0.237	0.173	0.179	0.069	0.064	0.075	0.076	0.111	0.123	0.052	0.111	0.062	0.090	0.090	0.090
Molybdenum (Mo)	mg/kg dw	1.7	1.1	0.712	0.448	0.211	0.395	0.383	0.371	0.406	0.116	0.464	0.325	0.534	0.209	0.255
Nickel (Ni)	mg/kg dw	113	307	124	22	33	32	48	49	52	27	44	47	65	54	61
Phosphorus (P)	mg/kg dw	9,035	10,073	10,654	9,093	11,555	8,285	18,262	19,084	14,728	5,697	20,272	16,341	14,709	15,294	14,584
Potassium (K)	mg/kg dw	12,773	18,525	13,101	9,576	12,870	10,659	15,492	12,728	11,504	3,384	15,082	14,037	11,673	13,434	13,188
Selenium (Se)	mg/kg dw	7.3	5.8	5.2	2.9	2.2	2.7	9.2	11	7.8	4.4	9.5	7.8	13	11	7.3
Silver (Ag)	mg/kg dw	0.261	0.412	0.268	0.165	0.117	0.213	0.067	0.105	0.093	0.105	0.099	0.105	0.148	0.140	0.198
Sodium (Na)	mg/kg dw	3,655	4,131	3,096	3,245	3,983	2,465	6,433	6,259	4,212	1,091	6,843	5,623	4,582	5,149	5,169
Strontium (Sr)	mg/kg dw	21	29	18	12	16	24	11	9.3	12	7.4	7.1	12	10	9.7	13
Thallium (TI)	mg/kg dw	0.083	0.155	0.081	0.021	0.013	0.028	0.112	0.154	0.130	0.059	0.091	0.119	0.081	0.066	0.084
Tin (Sn)	mg/kg dw	0.870	1.4	0.886	0.388	0.490	0.470	0.548	0.626	1.0	0.498	0.832	0.871	0.621	0.363	0.875
Titanium (Ti)	mg/kg dw	914	1,682	885	608	208	338	312	286	376	110	81.0	257	188	129	246
Uranium (U)	mg/kg dw	0.339	0.596	0.309	0.106	0.154	0.239	0.33	0.196	0.309	0.191	0.200	0.339	0.302	0.222	0.291
Vanadium (V)	mg/kg dw	20	49	24	5.4	4.7	9.3	7.6	7.5	9.6	3.3	2.5	7.3	4.8	4.0	6.9
Zinc (Zn)	mg/kg dw	225	241	257	98.0	108	101	191	195	216	104	187	141	168	179	153

Selenium concentration exceeds the 41 mg/kg dw Level 3 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 27 mg/kg dw Level 3 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 26 mg/kg dw Level 3 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 22 mg/kg dw Level 2 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 20 mg/kg dw Level 2 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 18 mg/kg dw Level 2 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 15 mg/kg dw Level 1 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 13 mg/kg dw Level 1 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 11 mg/kg dw Level 1 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 8.74 mg/kg dw 97.5th percentile reference concentration (i.e., the upper boundary of the normal range) used to identify a difference from reference (Minnow 2020b).

Notes: % = percent; mg/kg dw = milligrams per kilogram dry weight; < = less than; EVWQP = Elk Valley Water Quality Plan.

Table I.1: Chemistry Data for Benthic Invertebrate Tissue Samples Collected from Greenhills and Gardine Creeks, February and September 2022

		Up	per Greenhills Cre	eek				Lo	ower Greenhills Cre	ek			
			RG_GHFF						RG_GHBP				
Constituent	Units		Composite-taxa			Composite-taxa		Annelid-only	Composite-taxa	Composite-tax	a with Annelids	Annel	lid-only
	Ī	RG_GHFF-1	RG_GHFF-3	RG_GHFF-5	RG_GHBP-1	RG_GHBP-3	RG_GHBP-5	RG_GHBP-5	RG_GHBP-3	RG_GHBP-1	RG_GHBP-5	RG_GHBP-1	RG_GHBP-5
		08-Sep-22	09-Sep-22	09-Sep-22	28-Feb-22	28-Feb-22	28-Feb-22	28-Feb-22	12-Sep-22	12-Sep-22	12-Sep-22	12-Sep-22	12-Sep-22
% Moisture	%	79.8	78.3	81.8	83.8	85.7	82.9	83.2	82.0	78.3	81.1	73.9	68.3
Aluminum (Al)	mg/kg dw	2,677	1,950	1,957	6,600	1,737	1,199	10,483	1,494	10,772	817	7,501	6,987
Antimony (Sb)	mg/kg dw	0.119	0.103	0.112	0.122	0.091	0.061	0.292	0.073	0.399	0.050	0.335	0.305
Arsenic (As)	mg/kg dw	0.548	<0.431	0.630	1.2	0.814	0.458	8.9	0.817	4.1	0.723	5.1	6.4
Barium (Ba)	mg/kg dw	76	57	65	124	69	38	112	76	196	33	125	139
Boron (B)	mg/kg dw	3.0	1.8	2.4	6.9	3.2	1.8	7.9	2.2	13	1.3	8.5	7.2
Cadmium (Cd)	mg/kg dw	0.908	2.2	0.838	0.654	0.606	0.510	11	1.8	2.2	0.733	4.3	7.4
Calcium (Ca)	mg/kg dw	24,230	19,765	26,079	26,453	28,068	6,252	7,302	22,831	20,645	11,965	10,506	19,057
Chromium (Cr)	mg/kg dw	20	13	26	19	6.9	2.4	25	13	25	8.4	27	21
Cobalt (Co)	mg/kg dw	1.6	1.1	1.1	1.7	0.815	0.568	4.8	2.1	2.8	0.917	3.9	4.4
Copper (Cu)	mg/kg dw	14	16	23	27	24	19	13	35	22	25	14	15
Iron (Fe)	mg/kg dw	1,120	826	999	1,470	448	247	2,325	691	3,843	376	3,395	2,605
Lead (Pb)	mg/kg dw	1.4	0.796	0.774	1.2	0.589	0.425	1.6	0.600	2.5	0.334	2	2.4
Lithium (Li)	mg/kg dw	1.6	1.3	1.7	2.6	1.0	0.731	2.8	2.3	6.3	1.4	3.7	3.4
Magnesium (Mg)	mg/kg dw	2,144	1,745	2,912	2,763	2,453	2,168	1,672	2,515	3,158	1,239	2,923	2,678
Manganese (Mn)	mg/kg dw	36	24	32	109	100	91	69	66	104	33	87	104
Mercury (Hg)	mg/kg dw	0.076	0.080	0.080	0.098	0.101	0.098	0.624	0.102	0.211	0.071	0.277	0.376
Molybdenum (Mo)	mg/kg dw	0.278	0.186	0.487	0.487	0.442	0.261	0.902	0.348	1.3	0.186	0.923	0.858
Nickel (Ni)	mg/kg dw	46	32	54	43	26	13	51	29	61	16	73	62
Phosphorus (P)	mg/kg dw	12,280	11,775	16,394	12,342	12,250	12,728	12,041	11,912	8,694	8,950	8,666	9,523
Potassium (K)	mg/kg dw	10,134	9,140	13,932	10,870	8,693	9,410	10,735	10,234	11,354	8,943	11,778	11,191
Selenium (Se)	mg/kg dw	7.6	6.4	8.7	23	27	21	248	24	63	15	97	111
Silver (Ag)	mg/kg dw	0.157	0.157	0.174	0.257	0.238	0.104	0.479	0.314	0.316	0.134	0.179	0.262
Sodium (Na)	mg/kg dw	3,837	3,226	4,950	5,111	5,014	3,920	2,909	4,665	2,535	4,537	2,599	2,813
Strontium (Sr)	mg/kg dw	16	11	14	32	29	8.4	11	26	30	12	15	19
Thallium (TI)	mg/kg dw	0.063	0.041	0.056	0.148	0.057	0.047	0.261	0.073	0.105	0.047	0.086	0.283
Tin (Sn)	mg/kg dw	1.5	0.749	0.587	0.957	0.735	0.538	1.6	0.294	0.606	0.201	0.510	0.942
Titanium (Ti)	mg/kg dw	206	126	153	478	95	66	690	104	777	55	626	493
Uranium (U)	mg/kg dw	0.255	0.206	0.265	0.359	0.232	0.121	0.529	0.141	0.760	0.067	0.470	0.426
Vanadium (V)	mg/kg dw	5.6	3.8	3.9	7.8	2.2	1.3	10	2.8	19	1.4	13	13
Zinc (Zn)	mg/kg dw	92.0	131	137	165	163	152	156	171	178	120	247	180

Selenium concentration exceeds the 41 mg/kg dw Level 3 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 27 mg/kg dw Level 3 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 26 mg/kg dw Level 3 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 22 mg/kg dw Level 2 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 20 mg/kg dw Level 2 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 18 mg/kg dw Level 2 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 15 mg/kg dw Level 1 Benchmark for dietary effects to juvenile birds (EVWQP; Golder 2014).

Selenium concentration exceeds the 13 mg/kg dw Level 1 Benchmark for growth, reproduction, and survival of benthic invertebrates (EVWQP; Golder 2014).

Selenium concentration exceeds the 11 mg/kg dw Level 1 Benchmark for dietary effects to juvenile fish (EVWQP; Golder 2014).

Selenium concentration exceeds the 8.74 mg/kg dw 97.5th percentile reference concentration (i.e., the upper boundary of the normal range) used to identify a difference from reference (Minnow 2020b).

Notes: % = percent; mg/kg dw = milligrams per kilogram dry weight; < = less than; EVWQP = Elk Valley Water Quality Plan.

Table I.2: Comparisons Among Areas for Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples from Greenhills and Gardine Creeks, September 2018 to 2022

	ANOVA Model				Spatial <i>Post Hoc</i> Comparisons						
Transformation	Station	Year	Station:Year	Area 1	Area 2	MOD ^a					
Transformation	Otation			Alea i	Alea 2	2018	2019	2020	2021	2022	
				RG_GAUT	RG_GANF	-	ns	ns	ns	-57.2	
					RG_GAUT	-	-52.8	ns	-45.1	ns	
					RG_GANF	-	ns	ns	ns	-72.1	
				RG_GHUT	RG_GHNF	150	ns	ns	ns	ns	
					RG_GHDT	-	-	-	-	ns	
					RG_GHFF	ns	ns	ns	ns	ns	
	<0.001			RG_GHNF	RG_GAUT	-	-73.9	ns	-58.7	ns	
		0.045	<0.001		RG_GANF	-	-56.0	-63.0	-56.4	-55.9	
					RG_GHDT	-	-	-	-	ns	
					RG_GHFF	-56.4	ns	ns	ns	ns	
log ₁₀				RG_GHDT	RG_GAUT	-	-	-	-	ns	
					RG_GANF	-	-	-	-	-74.5	
					RG_GHFF	-	-	-	-	ns	
				DC CUEF	RG_GAUT	-	-58.1	ns	-57.2	ns	
				RG_GHFF	RG_GANF	-	ns	ns	-54.8	-65.6	
					RG_GAUT	-	-90.4	-76.0	-83.5	-78.7	
					RG_GANF	-	-83.8	-80.1	-82.5	-90.9	
				DC CUPD	RG_GHUT	-71.7	-79.6	-68.3	-69.9	-67.3	
				RG_GHBP	RG_GHNF	ns	-63.3	ns	-60.0	-79.3	
					RG_GHDT	-	-	-	-	-64.2	
					RG_GHFF	-69.1	-77.1	-68.6	-61.4	-73.5	

P-value < 0.05.

Significant increase relative to Area 1.

Significant decrease relative to Area 1.

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; < = less than; ns = not significant; - = no data; MCT = Measure of Central Tendency (backtransformed estimated marginal means).

^a MOD =  $(MCT_{Area 2} - MCT_{Area 1})/MCT_{Area 1}*100$ .

Table I.3: Comparisons Among Years for Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples from Greenhills and Gardine Creeks, September 2018 to 2022

	ANOVA	Area	Temporal <i>Post Hoc</i> Comparisons to 2018 (or base year)							
Transformation	Station	Year	Station:Year	Alea	MOD ^a					
Transformation	Station	i Gai	Station. Teal		2019	2020	2021	2022		
	<0.001	0.045	<0.001	RG_GAUT	Base Year	ns	ns	89.9		
				RG_GANF	Base Year	ns	ns	-51.8		
lo a				RG_GHUT	ns	ns	ns	ns		
log ₁₀				RG_GHNF	ns	ns	-42.8	-67.5		
				RG_GHFF	ns	ns	ns	ns		
				RG_GHBP	ns	ns	ns	ns		

P-value < 0.05.

Significant increase relative to 2018 or base year.

Significant decrease relative to 2018 or base year.

Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; < = less than; ns = not significant; MCT = Measure of Central Tendency (backtransformed estimated marginal means).

^a MOD = (MCT_{Examined Year} - MCT_{Base Year})/MCT_{Base Year} *100.

Table I.4: Mean Observed and Predicted Benthic Invertebrate Tissue Selenium Concentrations for Lotic Sampling Areas, Greenhills and Gardine Creeks, 2018 to 2022 ^a

Watercourse	Biological Monitoring Area	Year	Month	Tissue Selenium	Prediction Interval (mg/kg dw)			
	Monitoring Area			(mg/kg dw)	Lower	Mean	Upper	
		2019	September	3.5 3.4 2.7	2.6	5.1	10	
	DO CAUT	2020	September	4.3 5.0 5.5	2.5	5.0	9.8	
	RG_GAUT -	2021	September	3.9 5.1 3.9	2.6	5.1	9.9	
		2022	September	7.3 5.8 5.2	2.6	5.2	10	
Gardine Creek		2019	September	5.5 4.9 5.7	2.9	5.6	11	
		2020	February	4.4 5.6	3.0	5.9	12	
	RG_GANF	2020	September	3.8 5.4 3.3	2.8	5.4	11	
		2021	September	4.8 3.8 5.0	3.0	5.9	12	
		2022	September	2.9 2.2 2.7	3.1	6.0	12	
	RG_GHUT	2018	September	7.2 7.3 7.1	4.0	7.9	15	
			February	5.6 11 20	4.0	7.8	15	
		2019	September	6.4 9.2 7.1	4.0	7.8	15	
		2020	February	6.8 5.0	4.0	7.7	15	
			September	9.1 6.0 7.0	4.0	7.9	15	
		2021	February	8.8 6.4 5.9	4.0	7.9	15	
			September	7.9 7.5 7.9	4.0	7.8	15	
Upper Greenhills Creek		2022	September	9.2 11 7.8	4.0	7.8	15	
		2018	September	17 15 23	4.0	7.9	15	
		2019	September	15 10 12	3.9	7.7	15	
	RG_GHNF	2020	September	9.9 9.5 11	4.0	7.9	15	
		2021	September	10 11 10	4.0	7.7	15	
		2022	September	4.4 9.5 7.8	4.0	7.8	15	
	RG_GHDT	2022	September	13 11 7.3	3.9	7.7	15	

Mean selenium concentration exceeds the upper predicted limit.

Mean selenium concentration is less than the lower predicted limit.

Notes: mg/kg dw = milligrams per kilogram dry weight; % = percent.

^a Data are for composite-taxa benthic invertebrate tissue chemistry samples unless otherwise indicated.

^b This sample is an annelid-only sample.

^c This sample is an annelid-only sample whereas annelids were removed from the remaining samples in that sampling period.

^d This sample is a composite sample with annelids intentionally included because they represented more than 5% of the biomass in the parent sample.

Table I.4: Mean Observed and Predicted Benthic Invertebrate Tissue Selenium Concentrations for Lotic Sampling Areas, Greenhills and Gardine Creeks, 2018 to 2022 ^a

Watercourse	Biological Monitoring Area	Year	Month	Tissue Selenium	Prediction Interval (mg/kg dw)			
	Widnitoling Area			(mg/kg dw)	Lower	Mean	Upper	
			September	8.8				
		2018		8.8	3.9	7.6	15	
				6.3				
				5.5				
			February	4.9	3.8	7.5	15	
		2040	,	4.5				
		2019		5.9				
			September	8.5	3.8	7.5	15	
	<u> </u>			8.7				
Upper Greenhills	RG_GHFF		February	6.4	3.8	7.5	15	
Creek		2020	,	6.6				
		2020	September	6.8 6.7	3.9	7.6	15	
			September	5.8	3.9	7.0	13	
				14				
				8.4				
		2021	September	8.4	3.9	7.6	15	
				13 ^b				
		2022	September	7.6	3.9	7.6		
				6.4			15	
				8.7				
	GH_GH1_AS	2020	September	16	3.8	7.5	15	
		2018	September	14 25	3.8			
				30		7.5	15	
				22				
			February	54	3.8	7.5	45	
				32 31			15	
		2019	September	36		7.3		
				36	3.7		14	
				28 58				
			February	53	3.8	7.4	15	
				41	0.0		. •	
		2020		88 °				
Lower Greenhills			September	17	3.9	7.6	15	
Creek	DC CUE			24 21				
	RG_GHBP			33				
			February	33	3.9	7.6	15	
		2021		32 21				
			September	34	3.8	7.5	15	
			Coptombol	24	0.0	7.0	.0	
				248 ^c				
		2022	February	27	3.8	7.5	15	
				21 23				
				111 b				
				97 ^b				
		2022	September	63 ^d	3.8	7.5	15	
				24				
				15 ^d				

Mean selenium concentration exceeds the upper predicted limit.

Mean selenium concentration is less than the lower predicted limit.

Notes: mg/kg dw = milligrams per kilogram dry weight; % = percent.

^a Data are for composite-taxa benthic invertebrate tissue chemistry samples unless otherwise indicated.

 $^{^{\}mbox{\scriptsize b}}$  This sample is an annelid-only sample.

^c This sample is an annelid-only sample whereas annelids were removed from the remaining samples in that sampling period.

^d This sample is a composite sample with annelids intentionally included because they represented more than 5% of the biomass in the parent sample.

Table I.5: Comparison of Selenium Concentrations Measured in Benthic Invertebrate Tissues and Concentrations Predicted Using the Selenium Species Bioaccumulation Tool, 2022 ^a

		B-tool P	rediction	Field Measurements		
Watercourse/ Waterbody	Biological Monitoring Area	Water Sample Date	Predicted Selenium Concentration in Benthic Invertebrate Tissues mg/kg dw	Tissue Sample Date	Mean Selenium Concentrations in Benthic Invertebrate Tissues ^b	
Cardina Craak	RG_GAUT	14-Sep-22	4.14	14-Sep-22	6.10	
Gardine Creek	RG_GANF	13-Sep-22	3.53	13-Sep-22	2.60	
	RG_GHUT	15-Sep-22	7.40	15-Sep-22	9.33	
Upper Greenhills Creek	RG_GHNF	09-Sep-22	9.89	09-Sep-22	7.23	
Opper Greening Creek	RG_GHDT	16-Sep-22	8.98	16-Sep-22	10.4	
	RG_GHFF	08-Sep-22	8.74	09-Sep-22	7.57	
Greenhills Creek Sedimentation Pond	RG_GHP	19-Sep-22	24.6	19-Sep-22	19.5	
Lower Greenhills Creek	RG_GHBP	28-Feb-22	15.0	28-Feb-22	23.7	
Lower Greening Creek	NG_GHDF	12-Sep-22	23.1	12-Sep-22	34.0	

Mean benthic invertebrate tissue selenium concentration is higher than predicted.

Notes: B-tool = Selenium Speciation Bioaccumulation Tool, mg/kg dw = milligrams per kilogram dry weight.

^a Predictions of benthic invertebrate tissue selenium concentrations were derived using aqueous selenium speciation data and sulphate concentrations for each area and sampling event (February or September 2022) (de Bruyn and Luoma 2021).

^b Mean selenium concentrations are for composite-taxa benthic invertebrate samples only (i.e., the annelid-only and bivalve-only samples collected from RG_GHBP and RG_GHP, respectively, in September 2022 are not included).

Table I.6: Comparison of Selenium Concentrations in Composite-taxa Benthic Invertebrate Tissue Samples Collected from Greenhills and Gardine Creeks in February Versus September, 2019 to 2022

ANOVA Model ^a							Area	Do February samples differ from September samples within a given year?			
Area	Year	Month	Area:Year	Area:Month	Year:Month	Area:Year:Month		2019	2020	2021	2022
							RG_GANF	-	ns	-	-
10.004					0.007	RG_GHUT	ns	ns	ns	-	
<0.001	0.063	0.181	0.078	0.010	0.034	0.027	RG_GHFF	ns	ns ns	-	-
						RG_GHBP	ns	145	ns	ns	

P-value <0.05.

Concentration in February is significantly higher relative to September within a given year.

Concentration in February is significantly lower relative to September within a given year.

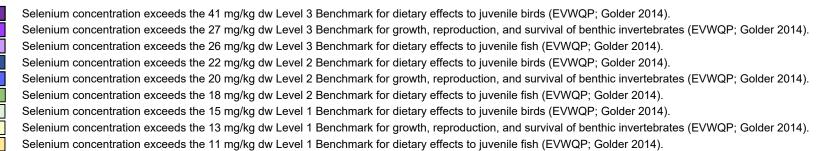
Notes: ANOVA = Analysis of Variance; MOD = Magnitude of Difference; < = less than; ns = not significant; - = no data; MCT = Measure of Central Tendency (back-transformed estimated marginal means).

^a The ANOVA was performed on log₁₀-transformed data and only areas that had both February and September samples within a given year were included in the analyses. *Post hoc* tests were conducted to compare February and September samples within a given year only.

 $^{^{}b}$  MOD = (MCT_{February} - MCT_{September})/MCT_{September}*100.

Table I.7: Chemistry Data for Benthic Invertebrate Tissue Samples Collected from Greenhills Creek Sedimentation Pond, September 2022

		Greenhills Creek Sedimentation Pond								
				RG_GHP						
Constituent	Unit	Compo	site-taxa							
		RG_GHP-3	RG_GHP-5	RG_GHP-3	RG_GHP-5	RG_GHP-6				
		19-Sep-22	19-Sep-22	19-Sep-22	19-Sep-22	19-Sep-22				
% Moisture	%	74.4	68.5	74.4	68.5	62.1				
Aluminum (Al)	mg/kg dw	17,565	12,097	5,346	13,719	17,305				
Antimony (Sb)	mg/kg dw	0.513	0.299	0.135	0.376	0.507				
Arsenic (As)	mg/kg dw	2.70	4.90	0.758	1.60	2.00				
Barium (Ba)	mg/kg dw	395	332	115	186	309				
Boron (B)	mg/kg dw	27.0	13.0	6.80	12.0	21.0				
Cadmium (Cd)	mg/kg dw	3.90	0.965	0.835	0.408	0.482				
Calcium (Ca)	mg/kg dw	34,842	84,225	226,246	174,784	182,701				
Chromium (Cr)	mg/kg dw	54.0	13.0	14.0	30.0	21.0				
Cobalt (Co)	mg/kg dw	5.50	3.30	1.50	3.60	3.10				
Copper (Cu)	mg/kg dw	60.0	40.0	12.0	23.0	12.0				
Iron (Fe)	mg/kg dw	6,754	3,316	2,016	3,206	4,835				
Lead (Pb)	mg/kg dw	5.10	2.70	1.40	2.50	5.90				
Lithium (Li)	mg/kg dw	9.00	5.80	2.40	4.50	6.60				
Magnesium (Mg)	mg/kg dw	3,989	3,623	783	1,387	1,269				
Manganese (Mn)	mg/kg dw	225	273	55.0	116	67.0				
Mercury (Hg)	mg/kg dw	0.373	0.0920	0.0750	0.0360	0.0570				
Molybdenum (Mo)	mg/kg dw	1.10	0.761	0.363	0.865	0.870				
Nickel (Ni)	mg/kg dw	110	36.0	27.0	62.0	38.0				
Phosphorus (P)	mg/kg dw	7,805	19,706	1,702	1,993	1,010				
Potassium (K)	mg/kg dw	9,435	5,535	2,550	4,091	6,122				
Selenium (Se)	mg/kg dw	27	12	5.30	6.80	4.90				
Silver (Ag)	mg/kg dw	0.582	1.30	0.144	0.306	0.140				
Sodium (Na)	mg/kg dw	3,835	1,328	1,592	1,337	838				
Strontium (Sr)	mg/kg dw	52.0	95.0	119	83.0	97.0				
Thallium (TI)	mg/kg dw	0.329	0.239	0.0800	0.192	0.265				
Tin (Sn)	mg/kg dw	1.80	1.10	0.394	0.449	0.913				
Titanium (Ti)	mg/kg dw	2,109	1,117	465	1,275	1,941				
Uranium (U)	mg/kg dw	0.888	0.618	0.205	0.447	0.617				
Vanadium (V)	mg/kg dw	44.0	23.0	10.0	25.0	44.0				
Zinc (Zn)	mg/kg dw	153	81.0	36.0	41.0	36.0				



Selenium concentration exceeds the 8.74 mg/kg dw 97.5th percentile reference concentration (i.e., the upper boundary of the normal range) used to identify a difference from reference (Minnow 2020c).

Notes: % = percent; mg/kg dw = milligrams per kilogram dry weight; < = less than; EVWQP = Elk Valley Water Quality Plan.